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Food Problems and Population

Agricultural Machinery and Equipment

WORLD CROPS

UNIV. OF MICHIGAN
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The International Journal of Agriculture

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The happiness of these children is delightfully infectious—
but please see page 372 for a story behind this picture

A Publication of The Leonard Hill Technical Group

Threat of empty rice bowls

There is no more important crop in the world today than rice; it is the staple food of half the world population.
Crop failures, brought about by pests that attack the paddy fields, threaten teeming millions with famine and distress . . . 90 per cent of the total world area under paddy is in east Asia. Here the chief danger of crop failure and famine repeatedly comes from infestation by the dreaded stem borer.
The importance of pest control in paddy fields is only too obvious. The stem borer is capable of occurring in huge numbers. Its larvae bore into the stem where they pupate. The attacked stems are hollowed out, and the plants fail to head.
Farbenfabriken Bayer have developed effective insecticides for controlling all rice pests. One of the most outstanding products is

Folidol

Growers of paddy have been using **Folidol** with full success for many years past, and already this product has on many occasions saved vast acreages of rice from complete destruction.
Thanks to **Folidol**, the stem borer is no longer a menace; thus, for millions of people the threat of famine has been banished.

Cupravit, copper spray
Pomarsol, TMTD spray
Folidol, E 605, methyl parathion, ethyl parathion
Metasystox, Systox, systemic insecticides
Dipterex, Gusathion, new type insecticides
Hedonal, herbicide
Tugon, fly killer
Seed dressings of all types for all uses
(mercury, hexachlorobenzene, TMTD, ODBH)

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Editorial Comment

World Food and Population

Hopes and Fears

THE great symposium on 'World Food and Population' is over and a special committee to keep the public informed about the problem of world food supplies and rising population has been appointed.

For the first time in the history of the British Association of Science, the members of the various sections met in plenary session. Sir George Thompson,[1] their President, who opened the conference said that, on the long view, the only possible answer to the problem of feeding the increasing world population was the voluntary restriction of birth to match the fall in the death rate. This, he added, was a difficult matter. He believed that a short-term solution is to be found in the improvement of agriculture, particularly in the less civilised countries where the problem is severe. The limits of production had not been reached but the immediate problem here was political rather than scientific.

The politician, he said, has to deal with the toughest, most resistant and most irritating material in the world—human nature. Nevertheless, scientists must not throw the problem entirely on to the shoulders of the politicians.

Dr. Norman Wright,[2] the first speaker, said that more than half of the inhabitants of the world were under-nourished or else suffering from faulty nutrition, but, contrary to widely-held beliefs, world food production was at present increasing at a slightly faster rate than world population—the essential point was that the production increases were not uniform. The next speaker, Prof. D. G. Glass,[3] said that we could not count too heavily on birth control as a means of restricting the rate of increase of population during the present century. In a subsequent paper to members of the Economics and Sociology sections, he went further than this and said that although at the present rate of increase world population would double itself by the turn of the century, actually the rate of increase might be stepped up due to the improved health measures in backward countries and the increased virility of the people. It was, he said, quite conceivable that the number of people in the world might be doubled in 25 years.

Prof. Dudley Stamp[4] said that the problems were staggering and their solution an urgent matter. The world adds a population equivalent to that of Australia in less than three months, that of all Canada over five months, and that of crowded Britain represents one year's increment. In his paper he stressed the need for the planned use of world land resources.

Prof. H. D. Kay,[5] a world authority on livestock husbandry, placed even more emphasis on the difficulties than the other speakers. Unless ways were found of overcoming the present slowness in putting the available knowledge to use, he found it difficult to see how nutritional catastrophes could be avoided.

Matter of Urgency

In the general discussion which followed, Mr. James Callaghan,[6] M.P., said that what was wanted was a greater sense of urgency. It was folly that we were not even on speaking terms, through the United Nations, with China, which has the biggest increase in population. He wanted to see a permanent organisation set up to deal with all aspects of these urgent problems.

Sir Charles Darwin, grandson of the 19th century scientist, who followed him said, that man had 100 years left in which to solve the problem of limiting his population, but for various reasons birth control was not proving an effective answer. If we do not succeed, life would become increasingly harder and there would be a relapse, not necessarily to barbarism, but to a kind of civilisation, far from humane.

Robust Optimism

Prof. Blackett,[7] who wound up the discussion, concluded that a robust optimism was the only basis for effective action, but what the Americans call a 'crash' programme was needed to deal effectively with a rapidly worsening situation. The gap of living standards between the rich and the poor countries, and the gaps in the food situation presented the greatest moral challenges of today. The potential resources of food production were very great, but fundamentally, the drive to develop these resources in 'hungry countries' must come from the hungry countries themselves.

The question of capital aid for needy countries must play an enormous part and Western countries also had a part to play in providing technical aid. 'We must be prepared in the Western world to use power and wealth wisely and generously, but the most important thing is to acquire a sympathetic under-

1. Master, Corpus Christi College, Cambridge University.
2. Deputy Director-General, Food and Agriculture Organisation.
3. Professor of Sociology, University of London.
4. Professor Emeritus, University of London.
5. Professor Emeritus, University of Reading.
6. Member of Parliament, S.E. Division of Cardiff.
7. Professor of Physics, Imperial College of Science and Technology, London University.

standing of the conditions and way of life of the people of those countries needing help'.

He made a plea for 'technical missionaries' from British universities and colleges to spend some years overseas, learn about these things, and to pass on their technical education to help to increase food production in the under-developed countries.

. . . and Realism

'DESPITE INDIVIDUAL and joint action by nations, there has been no really substantial progress made towards solving the problem of feeding the world', said Monsieur V. Lavalleé, Assistant Director General of FAO, at Oxford recently, when addressing the Freedom from Hunger conference of the Oxford Committee for Famine Relief. He said that there had been some increase in the production of food, but it barely kept pace with the population increases. The position in the Far East was very serious.

The optimists are unduly impressed by the serious over-production of wheat and maize in advanced countries like the U.S.A., Australia and Canada, and argue that these surpluses can readily be transferred to other countries, or that backward countries can easily follow suit and that it is *only* a matter of agricultural education, technical assistance and credits.

It is possible to give temporary relief to countries in a state of famine by dumping shipments of surplus grain in the needy countries, but in the main this is not a permanent solution, for *food must be produced where the mouths are.* See WORLD CROPS, 1959, **11**, 268, and 1960, **12**, 88.

Failure of Plans

The reason for the failure of Plans to achieve targets was explained by V. S. Swaminathan on page 297 of our September issue. It is apparent that what is needed is firm leadership with the responsibility effectively decentralised down to the district officers who should take the initiative and be held personally responsible for agricultural progress within the boundaries of their districts, as it was in the 'bad old Colonial days'.

This organisation is, in effect, now lacking because those who have now assumed responsibility have either not had enough senior administrative experience nor have they the agricultural experience nor the forceful initiative to bring marginal lands into effective cultivation or to increase the productivity of the lands already in cultivation.

They are not to be blamed for this. The responsibility rests with those idealists, 'do-gooders' and theoreticians who, by their incessant nagging, have forced the pace of granting independence. You cannot change a people by education in a generation or two.

Under the better colonial regimes, sound and steady progress towards eventual self-government was the objective, and during the next hundred years there would have been a gradual change-over with the subject peoples taking on more and more responsibility and learning by experience. This was actually happening in Malaya and was peacefully effected in Ceylon several years ago. In other countries, the reckless and precipitate haste with which the policy of self-government has been implemented, regardless of the consequences, does not augur well for the future—either for the 'East' or the 'West'.

The recent troubles in the Congo found the Organisation of the United Nations quite unprepared. A police force had to be hastily improvised to meet a situation which should have been foreseen, for it was obvious to anyone with overseas experience that a reversion to tribal warfare, slavery, witchcraft, and subsistence agriculture must be the inevitable consequence of the chaos resulting from the sudden grant of independence to backward peoples. In the circumstances, what is to be anticipated for agriculture and industry in these countries?

Reform FAO

We have felt for some time that the policy of FAO with regard to assistance to under-developed and undeveloped countries is also not adequate. It is, we submit, not enough to show the way by the printed and spoken word. Responsibility for results is essential.

Just as UNO was ill-prepared to meet a serious situation, so also is FAO, for it is prevented by its constitution from taking an active part in the implementation of its excellent advice and recommendations. It also lacks the men and the money.

The various colonial agricultural services have melted away and what is left? A few well-trained Africans and Asians, who have been adequately trained and are fit and able to take up higher responsibility, but these are hampered in their work by democratically-elected ministers, who are not unnaturally more concerned with vote-catching than agriculture, and by the incompetence of some of their subordinates who have been too hastily promoted, sometimes for political reasons, to posts for which they are not fitted, either temperamentally or because they lack enterprise, initiative and inspiration.

A very serious situation is developing—the backward countries of the world are not increasing their productivity commensurate with their population increases, and a decline in world trade leading to the conditions of 1929 is quite possible unless prompt action is taken by the United Nations to alter the constitution of FAO and provide the funds to allow it to assume operational and executive functions, either to meet an emergency or if it is invited to do so by a newly self-governing territory in immediate need of such administrative technical assistance.

One World

Prof. Arnold Toynbee, formerly Director of Studies, Royal Institute of International Affairs, has said that, despite political differences, hunger may force the nations of the world to unite under one government within the next 25 years.

It is not our wish to 'Cry Havoc'. We would always rather give credit where credit is due. But the situation is far too serious. It is not only hunger, with the possibility of major or minor wars and revolutions due to economic stresses and strains, there is also the very real possibility of a repetition of a world in depression unless appropriate steps are taken at once to arrest a gradually deteriorating situation.

Unused Acres

ALTHOUGH AGRICULTURE is the world's leading occupation and agricultural commodities loom large in trade between nations, the amount of land on which crops are grown is surprisingly small. Of the 39,000 million acres that compose the earth's land, only 2,500-3,000 million acres are now being cultivated, according to Professors R. M. Highsmith, jun., and J. Granville Jensen in 'Geography of Commodity Production'.

They state that the best lands are naturally being utilised, but agricultural technology may make possible the use of large areas of the tropics. Irrigation may be extended to the deserts and the dry cold frontiers may be pushed back.

No world inventory of potential croplands has ever been made, although in recent years agricultural scientists and geographers have speculated on the maximum productivity of agriculture. Most of them agree, however, that the absolute limits have not yet been reached. Any answer to the question 'How much new cropland can be added to what already exists?' is debatable, but estimates now range from 1,000-8,000 million additional acres.

The problem, however, does not end here. The real problem is in the imbalance of populations. While there are still vast unused open spaces there are also dangerous over-concentrations of populations.

Defects in Diets

WHILE NO ONE is actually starving in Africa, there is abundant evidence that defects in African diets affect the health of the population, according to Marcel Autret, acting Director of the Nutrition Division, FAO. Nutritional surveys show that carbohydrate foods generally provide three-quarters of the calories and constitute 90% of the food consumed.

In newly developing countries the quest for better nutrition is involved with social, economic and technical factors. Thus an African mother will wean her child at the age of 18 months and then place it on the same starchy diet that she herself consumes. As a result roughly 30% of the children born alive die before they reach the age of five. Among certain tribes the mortality rate in this age group has been as high as 60%, and in many parts of Africa, parents expect one child out of two to die before reaching its fifth birthday.

Protein malnutrition in children can lead to *kwashiorkor* —a disease marked by retarded growth, mental apathy, fibrosis of the liver and heavy mortality in the absence of proper treatment. Anaemia, vitaminosis, riboflavinosis also often occurs in children because they lack vitamins and minerals in their diets after weaning.

Lack of Proteins

Food habits tend to keep protein out of the African diet. In most parts of Africa meat is rarely consumed, even where cattle and goats are numerous. Owners consider the beasts to be capital. As a result, excepting festivals and celebrations, cattle are eaten only when they die of old age or of disease. Chicken and eggs are used as gifts and game is becoming scarce.

While food taboos that infiltrate the Africans' diet are tending to disappear, they still forbid the consumption of animal protein by the most vulnerable groups of the population—pregnant women, nursing mothers and young children.

Butter is more often used as ointment or cosmetic than as food. Milk is so little valued that certain pastoral tribes in the north of Uganda live on millet

'After that it was only a stage further to design the one that produced the wrapped sliced loaf'

and root crops and give away the milk to their herdsmen. In the towns and a few other areas, however, milk is appreciated, but it is too expensive for all but the most privileged. Fish, a cheaper and excellent source of animal protein, is much liked by the African in dried, smoked or salted form, but is generally too expensive for him.

Excess of Starchy Foods

The range of crops that can be grown in the equatorial forest is very limited, while in the drier parts of Africa the short growing season confines cultivation to millet and sorghums. A wider range of crops could be planted, but through ignorance and the high yield coming from starchy crops the African tends to stay with the high-calorie, low-protein starchy staples. Thus cassava, or tapioca, is highly regarded as a famine reserve, for it can be stored in the soil for some time and is immune to locust damage.

Cultivation of crops usually falls to the women, who, with their other work, do not find time to grow enough of lower-yielding crops, such as vegetables and legumes.

When cash crops, such as cocoa, cotton or groundnuts, replace the traditional food crop of an area, or when a family takes up wage employment, the African tends to buy prestige foods, such as white bread and sugar, rather than add the much needed protein to his diet.

This Month's Cover Picture

This month's cover picture was taken in the Kingdom of Tonga and we like to think that the joy of these children symbolises tomorrow's happy world. But hungry people are not happy people, and agriculture has much to achieve before the world has enough food. We who 'till the land' hold it in trust for the children of tomorrow, and one of the ways in which we can be sure of increasing and maintaining land fertility is by the wise use of modern methods of irrigation.

Your enquiries in regard to any irrigation problem, large or small, will be welcomed by:

FARROW AND SONS LTD.
Irrigation & Drainage Engineers
Spalding · Lincolnshire . England

New Protein-Rich Foods

The use of certain protein-rich foods, such as presscakes of groundnuts and fish flour, is being investigated in Morocco, the Belgian Congo, Nigeria, Senegal and Uganda, the Republic of Togo, Angola and the Cameroons. A fish flour plant, built by private industry with assistance from FAO in Morocco, produces a ton of flour a day. New fish products are also being produced and tried in Tunisia. A groundnut flour factory capable of producing 10 tons a day of a highly nutritive protein food has had its produce approved for sale in West Africa. There are also plans for establishing a biscuit factory in Uganda, the flour being made of local maize and groundnuts.

A project approved for FAO's recently launched Freedom-from-Hunger Campaign, and supported by the committee of German bishops who are providing the funds, is to grown grain legumes.

Making Known

WHAT GOES to make a good advertisement? The size of the advertisement is important. A full-page advertisement is obviously better than a tiny advertisement and a 2-page spread is far more arresting than a single page.

An advertisement can be made arresting by being humorous, artistic or informative, and, providing the text does not crowd all the available space, it will be read by most readers.

Pictures, drawings and diagrams serve the same purpose—almost without needing a caption. A dramatic photograph or a forceful drawing, with subsidiary sketches, can make a most arresting display. The use of colour is sound—indeed, the coloured picture on the front cover is noticed by every reader, without exception.

Finally, a repeat advertisement, provided it is good will attract as many as it did on the first appearance. It is by repetition that an idea can be fixed in the mind, and the reader will remember the product advertised when the occasion arises. 'Repeats' are, therefore, sound advertising.

The products of the manufacturers of agricultural machinery and chemicals are today playing a tremendous and vital role in the advancement of world agriculture. It is only by making known and having their products explained to the world that the full impact of modern machinery and modern methods can be obtained and their widest utilisation secured.

World agriculture can then steadily progress to meet the ever-growing demands for food and raw materials, and so raise the living standards of all the nations on earth, that peace will be established on a safe and secure foundation and life can go on.

Left: *Rio de Janeiro, the former capital of Brazil, often described as the most beautiful city in the world—but there is no room for expansion* Right: *Brasilia—the new capital of Brazil—as seen from the verandah of the Presidential Palace. The tall twin building will be the Secretariat and the audacious saucer-topped building will house the Senate*

Advancing Agriculture in Brazil

Brazil, with well over two million sq. miles of undeveloped lands, suitable for agriculture, can play a leading role in easing the fundamental problem of increasing the world's supplies of food and essential raw materials. The scope for agriculture expansion in Brazil is indeed enormous, but the shortage of foreign currency is holding up developments.

AT the present time, when Brazil is passing through a period of tremendous industrial and economic development, the most pressing agricultural problems have not been overlooked. Foremost among these is the need to increase exports and reduce imports by increased industrial and agricultural production.

During the past two years, a sustained effort has been made to increase exports of *coffee*, the main outgoing product. In July and August of 1959 the number of bags exported exceeded all previous figures, and the U.S. Department of Commerce has announced record imports of coffee during September, when for the first time, it received more than 3 million bags in a single month; the previous highest import figure was recorded in December 1948—some 2.5 million bags. See also page 405.

The Brazilian Government recently sent an Economic Mission to the U.S.S.R. to negotiate treaties which would allow Brazil to expand her markets by crossing new frontiers—evidence of the efforts being made to find new markets.

As regards *cotton*, the 1959 crop is expected to be more than enough to meet the demands of the home market. The following figures have been recorded for the cotton crop in the south of Brazil: the production in São Paulo was 190,000 tons, in Paraná, 35,000 tons, and in Minas Gerais, Mato Grosso, Estado do Rio and Goiás, 15,000 tons, each. The most conservative estimates indicated that the crop in the north-east of Brazil was likely to exceed 100,000 tons.

Brazil now stands a good chance of regaining a large share of the world's cotton markets. The São Paulo Stock Exchange assessed a carry-over on 31 December last of 50,000 tons. Thus, at least 100,000 tons, worth 60 million dollars, will be available for export this year.

In the *sugar* sector, in spite of a very severe drought which affected production, all the plantations in the north-east began to harvest their crops at the beginning of September. The crop was given as 51 million bags. The State of Pernambuco alone was expected to produce 12 million bags; São Paulo, 23 million; Paraná, 2 million; and Minas, 1 million. And this does not take into consideration production in the smaller States.

Figures issued by the Ministry of Agriculture for *rice* show that last year, this crop covered 11% of the total area at present under cultivation in Brazil. During the last 20 years, the area under this crop has been increased by 180%, and this increase in area has been surpassed by increased productivity, equivalent to 236%. Today, rice stands fifth among the ten leading economic crops in Brazil.

A steady increase in the domestic consumption of *wheat*, has followed increased population and the increase in *per capita* income. The inadequacy of home production to meet these demands has made it necessary to import wheat, thus causing a constant drain on the balance of payments. Plans to encourage the growing of wheat, and to increase production of this crop are included in the development programme of the Government.

The target for wheat in 1960 is 1.5 million tons, the figure of 700,000 tons produced in 1957 being the basis of calculation. In ten years the area under wheat has been doubled and whereas, in 1949, it amounted to 630,000 ha., in 1958 it was 1,290,000 ha. Wheat-growing is concentrated in the south of Brazil, especially in Rio Grande do Sul, where 85% of the total cultivated area is given over to its production.

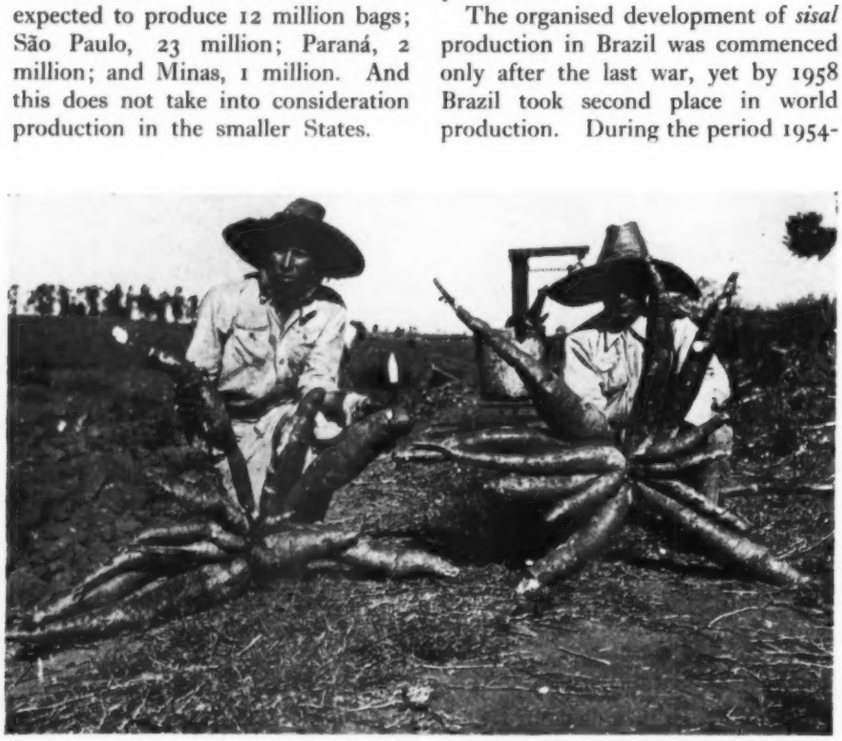
The organised development of *sisal* production in Brazil was commenced only after the last war, yet by 1958 Brazil took second place in world production. During the period 1954-1958, production was doubled, reaching 135,221 tons. The State of Paraiba alone has doubled its production in the last ten years, and is still the leading producer, but the other sisal-producing States all made relatively greater advances during the same period. Brazilian exports of this fibre in 1959 were 113,481 tons.

Coffee beans being tossed high to remove foreign matter

Cocoa was the subject for discussion at a meeting recently held in Rio de Janeiro at the instigation of the Working Committee on Cocoa of the Ministry of Agriculture and attended by 60 cocoa experts, exporters, planters and manufacturers. At this meeting it was stated that stocks were being exported at a fairly brisk rate, thus establishing favourable conditions for steady prices. Bahia, the source of 97% of the country's total production expects to produce record crops this year.

Nevertheless, the Working Committee has decided to adopt several measures aimed at increasing cocoa production: to enforce the use of selected planting material; to encourage the planting of the 'Catongo' variety of cocoa; to assist the rehabilitation of neglected plantations; to encourage research in plant protection; and to provide financial assistance to planters, in need of capital.

It is not generally realised that Brazil is the world's largest producer of



Tapioca or cassava, Manihot utiliśsima, *var.* 103, *Brava de Itu, each cluster of root weighing about* 40 *lb.*

Cutting sugar cane in Brazil

bananas, and in 1957 produced no less than 234 million bunches. This is because only 10 million bunches were exported. However, Brazilian exports of bananas, following a period of stagnation during the war, have begun to show a steady increase.

It is evident that in all sectors of agricultural production, exports are increasing, and it is therefore to be hoped that the country's balance of payments will steadily improve. Then provided world prices for these agricultural products remain stable, Brazil can continue to make progress.

This article is based on information supplied by the Brazilian Government Trade Bureau in London.

Storage Infestation

The incentives for which owners of goods and storage premises in the U.K. undertake infestation control measures were examined by Dr. E. E. Turtle, retiring chairman of the Pesticides Group of the Society of Chemical Industry, speaking at the annual general meeting of the Group in London recently.

In a paper on 'Trends in the Control of Infestation of Stored Products' he pointed out that formerly the objects were simply to conserve basic and strategic stocks of food. Now, however, incentives in the more highly developed countries were more diffuse. The risks in terms of direct losses in the weight of commodities or the amounts of human foodstuffs consumed by insects tended to be overshadowed by other considerations; these stemmed largely from the trend towards higher quality. The present incentives include the desire of shippers, warehousemen and merchants to avoid claims against them concerning insects on their goods or in their premises and of manufacturers to maintain goodwill towards their products.

Dr. Turtle referred to legislation in the U.K. on the infestation of food and compared the significance of 'food hygiene' considerations in the U.K. and in the U.S.A. He emphasised the international aspect of this field.

Important recent developments in control methods were surveyed, with observations on the extent to which pesticides may contribute in the future. Finally, the lecturer drew attention to the potential applications of control overseas, particularly in the less developed countries.

Moroccan Expedition

Seven undergraduates from Wye College of the University of London have left for the Central High Atlas mountains of Morocco to make a study of the agriculture of certain Berber tribes.

Controlling Wild Oats

This seems to be wild oat year in Britain. Many fields of winter corn, as well as spring corn crops give the impression that every wild oat seed in the soil has germinated.

The Experimental Husbandry Farm at Boxworth, situated on the heavy clay soils between Cambridge and Huntingdon, is in an area where the common wild oat has been widespread and a really serious pest for some years. The trials on this farm show very strikingly at the present time how wild oats can be reduced through a spring fallow followed by late-sown spring barley or spring wheat.

Three successive years of this spring fallow eliminates wild oats completely on the Boxworth clay. The loss in yield through delaying sowing until the end of April averages $3\frac{1}{2}$ cwt. per acre of barley a year. It is interesting, too, that burning the straw behind the combine has led to fewer wild oats in the following corn crop, according to a recent report by the M.A.F.F.

Tree Pruning in Californian Orchards

T. A. DICKINSON

Mechanical pruning, a possibility long ignored by fruit growers in most parts of the world, has recently been adopted in both deciduous and citrus fruit orchards throughout California, as pruning is one of the three heaviest items in the cost of production.

METHODS of mechanical pruning can be classed as selective and non-selective.

In selective pruning, men, working either from the ground or on raised platforms, use either electric or air-powered saws and shears to remove surplus and unwanted branches. Such equipment could also be used for non-selective pruning, but, where the terrain permits, greater uniformity is obtained if hedging and topping cuts are made with tractor-mounted power saws.

Deciduous fruit growers at present tend to prefer selective pruning methods and citrus growers to use the non-selective method.

Thus lemon growers are inclined to use non-selective methods in order to reduce the size of their trees; to facilitate harvesting and spraying operations; to force the growth of wood that is capable of bearing first-grade lemons, especially in the case of aged trees; and to inhibit the growth of vigorous shoots which might ultimately result in broken branches.

On the other hand, many progressive farmers feel that lemon trees also require selective pruning, since the trees tend to become too bushy if they are only mechanically hedged and topped and are not centrally thinned.

Due to their natural vigour, lemon trees usually require more pruning than other species of citrus. They sometimes require mechanical topping twice a year, in addition to the annual hedging and thinning treatments.

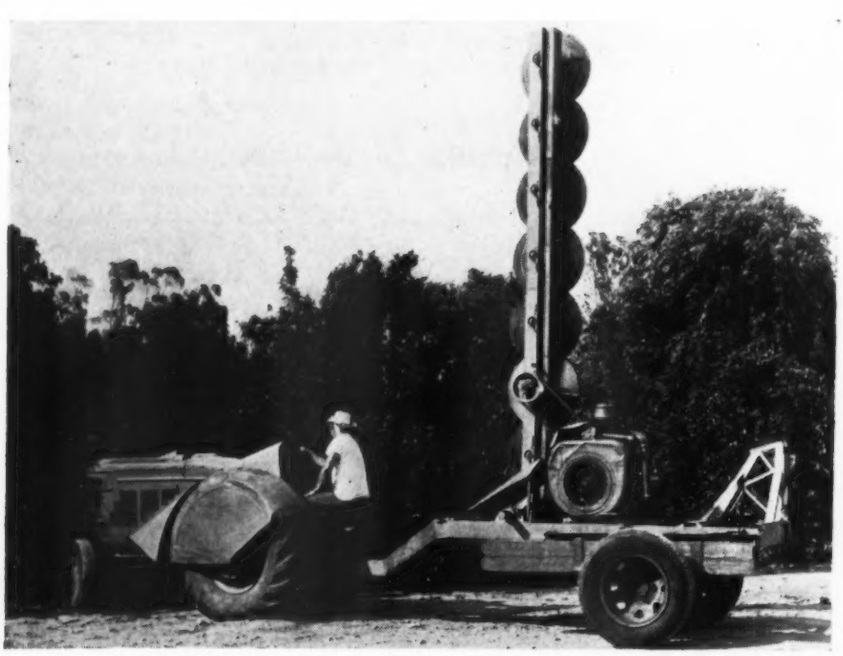
An electric power saw being used to thin out the foliage of a fruit tree

Drastic or non-selective pruning

Other types of trees may require even more drastic treatment. Old orange and deciduous trees, for instance, are sometimes 'skeletonised' or cut back to the point where each consists of nothing more than a trunk and the stumps of two or three large branches. This is to force them to produce new wood capable of bearing fruit.

Some Californian growers, however, believe that all drastic or non-selective forms of cutting do more harm than good, but state horticultural authorities are agreed that, if the trees are healthy, the most severe pruning can cause nothing worse than a temporary loss of production, if done at the right time.

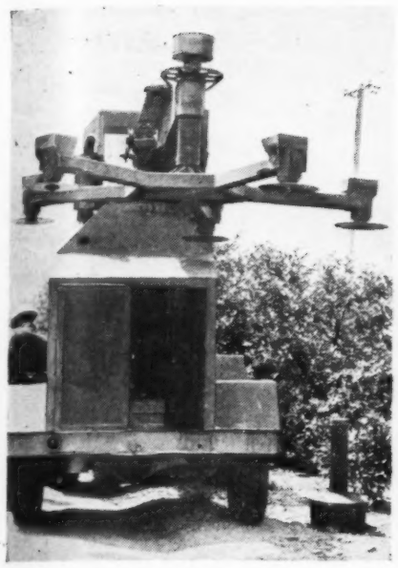
Citrus trees, being evergreens, can be pruned during any month of the year (although such work is not commonly done in the summer or autumn), but deciduous trees must usually be pruned in the winter when they are dormant.



A heavy-duty hedging machine with a vertical set of rotary saws entering a lane in an orange orchard

Machine pruning

Where heavy, non-selective pruning



The 'Whirlybird' topping machine has five rotary cutters actuated from a central shaft. On the right it is seen in action in a Californian orchard

is desired the work is usually done with machinery operated by contractors. The machines usually used for hedging and topping are made up of a series of rotary saw blades, mounted on either vertical masts or else carried on horizontal arms, and these are taken through the orchards on trucks or tractors.

An unusual topping rig that is gaining popularity is the 'Whirlybird', so called because its five rotary saws on fixed arms, which rotate in a horizontal plane, make it resemble a helicopter. Its main virtue is its ability to throw brush out of the trees.

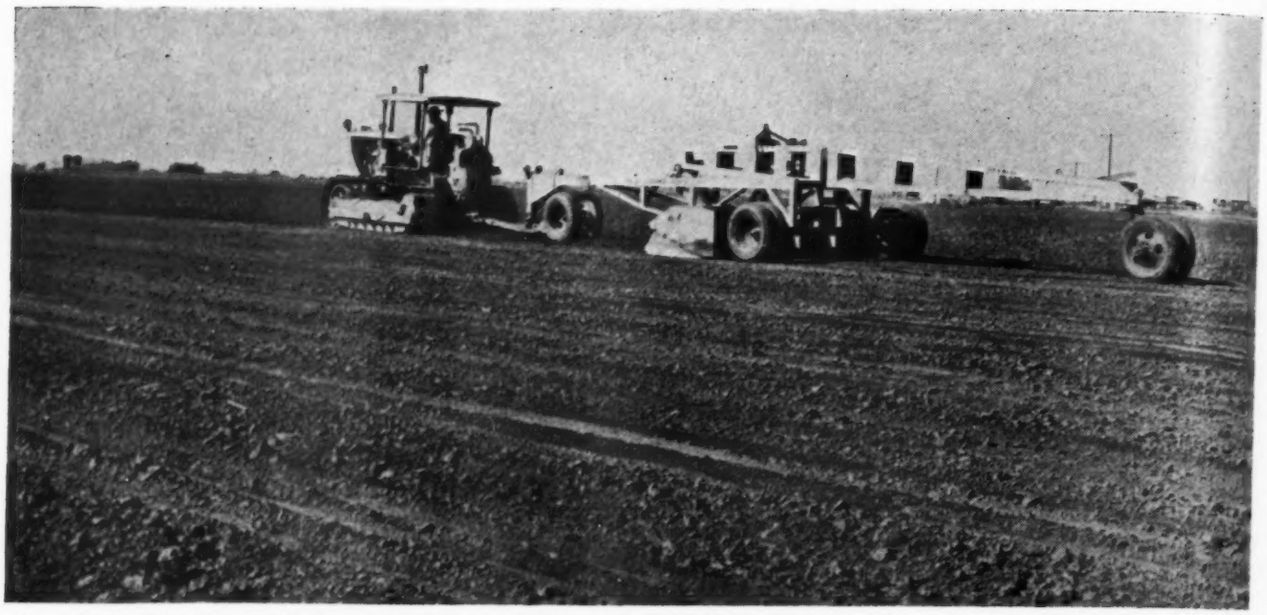
In orchards which require only light maintenance pruning, sickle-bar rigs, which are manually operated, are being employed as well. Such rigs are usually self-propelled machines with cutting blades that can be either horizontally or vertically mounted, either for topping or hedging.

Brushwood disposal

To dispose of the brush produced in these pruning operations growers in California follow either of two procedures. Some, believing that decaying wood and foliage will cause or spread disease, burn all the brushwood. Others, believing that all organic matter should be returned to the soil, shred the cuttings to a mulch, which is left to decay in the lanes between the rows of trees.

Two men operating electrically-powered, rotary saws for selective pruning from tractor-mounted platforms

A tractor-mounted, horizontally-aligned cutter-bar for topping trees in a Californian orchard



Accurate levelling is essential where water is scarce. The seed bed is finished with a Be-Ge scraper-plane drawn by a D7 tractor

In Arid Arizona

Useless Desert has become Valuable Cotton Land

Arizona, one of the 50 constituent states of the U.S.A., is bounded N. by Utah, E. by New Mexico, S. by Mexico, and W. by California and Nevada. This article concerns Pinal country in the south-east of the state, where the greatest obstacle to agriculture is lack of water. There is a lesson here for people in other arid lands.

NOT many years ago, Pinal county, south of Phoenix, Arizona, was mostly parched desert of a forbidding barrenness and with a striking vegetation of thorny mesquite scrub and cacti of many varieties, some reaching a height of 40 and even 50 ft.

Yet the soil is inherently fertile, for indigenous grasses and a rich displays of wild flowers appear with the scanty rains, which so often are only violent storms of short duration. The soils in the southern part of Arizona are mainly sandy loams, varying from light to heavy, and they are in general rich, although deficient in nitrogen and in humus, due to the burning action of the hot sun and the total absence of any green cover. In some areas, the soils are densely compacted.

Basically, the most useful crops in such conditions are leguminous green manures, especially alfalfa, which if water is available, can produce four to seven cuttings a year; this has proved of great value in providing nitrogen and building up the organic matter in the soil, but, of course the greatest obstacle to agriculture has been the lack of water, yet water is available deep down in the soil and the floodwaters in the streams and rivers too can be impounded for purposes of irrigation.

Water and tillage

It was an Indian—the late Diwan Singh who, through his knowledge of cotton-growing and irrigation from tube wells in his native country, was the first to recognise the real value of what appeared to be utterly useless land. This man, who arrived with only 65 cents in 1906, died in 1956 owning more than 10,000 acres of valuable cotton land, which was once parched and unproductive desert—a transformation brought about by water raised from wells and by a system of rough tillage which broke up the compacted soils, gave proper aeration and ensured root penetration down to the reservoir of water in the sub-soil.

Today his son, John D. Singh, carries on the tradition, but he has improved on his father's rough ploughing technique and simple ditch irrigation by using modern machines and methods, incorporating the principle of deep ploughing, building miles of irrigation canals and sinking deep wells. He has extended the area under irrigation to 12,000 acres. This once useless land now keeps 30 men in regular employment and some 300 migratory workers are required for the harvest.

This year, he has planted 4,200 acres; of this, 2,600 acres are under cotton and the rest is planted with cereals and vegetables which include

lettuce, watermelon and cantaloupe melons. These vegetable crops and 130 acres of Pima long-stable cotton are registered as seed crops—all this on land which formerly produced the thorny mesquite and prickly cacti.

Sequence of operations

His first operation is ploughing either to break up a virgin compacted soil or to bury previous crop residues, for it is the law that all cotton stalks must be buried before 20 January to a depth of at least four inches to smother the grubs of the pink bollworm. For this, ordinary disk harrowing is not sufficient and instead the land is ploughed to a depth of 16-17 in., using a *Caterpillar* D8 tractor drawing a 4-furrow, reversible, Atlas HD 418 plough. Sometimes it is necessary to work round the clock in shifts and in this way it is possible to cover from 40-42 acres in a day.

Since water is so scarce, accurate levelling and grading are essential to ensure that the water will flow slowly through the fields, give maximum penetration and be spread uniformly over the largest possible area. Obviously there must be no low spots where the water can accumulate and even produce water-logged conditions while the rest of the land goes short.

The third operation—rough levelling—is done the following month by a No. 12 motorised grader, and this is followed by land planing using a D7 tractor drawing a *Be-Ge* scraper plane, 50 ft. long x 12 ft. wide. The land is levelled at a rate of about 70 acres in a 20-hour day.

Water the key

In early March, *i.e.* one month before planting, the fields are flooded for 30-40 days, thus allowing the water to soak deeply into the soil. In consequence, even though the sun will dry up the surface moisture during the hot months, the long tap roots of the cotton plants are able to reach down and find water in the lower strata of the soil.

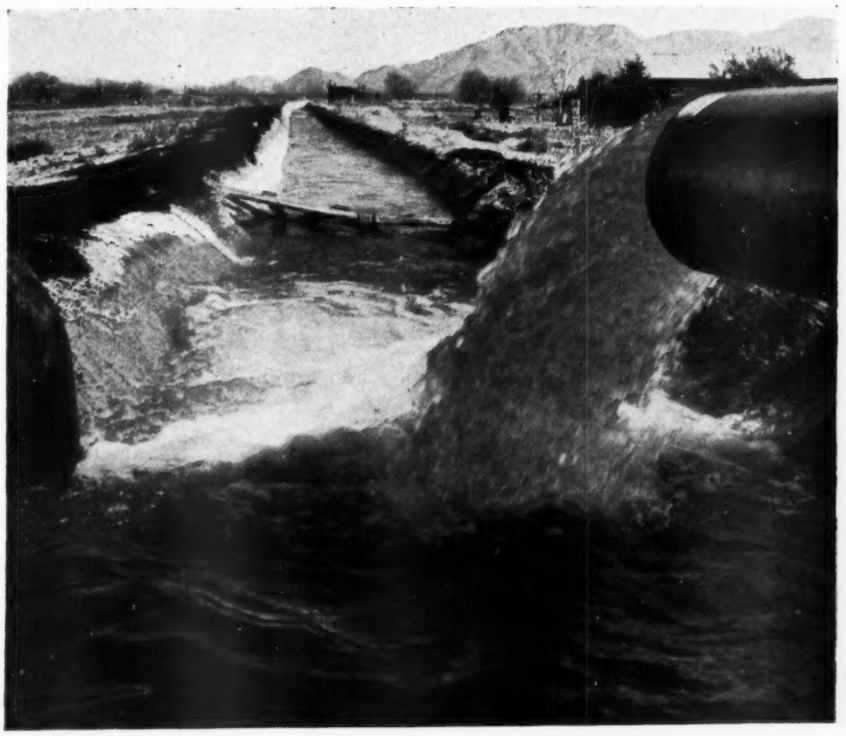
This water is obtained from 21 wells by means of *Byron Jackson* submersible pumps, each delivering at an average rate of 2,000 gal. per min., and it passes into a network of irrigation channels, drains and ditches. There are some 12 miles of earth channels and 28 of concrete-lined ditches, making a total of 40 miles of water channels feeding the 12,000 acres, at present under irrigation. The latest channel made, is concrete-lined and about 4,000 ft. long, and can handle a flow of 3,000 gal. per min., from a pump powered by a G 397 turbo-charged gas engine.

Planting and protection

The cotton is planted early in April about 2 in. below ground level and the soil is ridged about 4 in. high. Seven days later, the land is lightly harrowed and fertilisers, rich in nitrogen and phosphate are applied. Insecticides too are used, as and when recommended. The ultimate result of all these operations is an overall crop of two and a half bales of cotton per acre, it is claimed.

Ploughing in the crop residues using a Caterpillar D8 Tractor with a 4-furrow reversible plough, cutting 17 in. into the soil

Photos: Caterpillar Tractor Co. Ltd.



The largest pump in Pinal county is powered by a D 397 turbo-charged diesel engine

Rice Harvesting Machine for Smallholders

C. BERGER

SMALL farmers, like those who, since time immemorial, have been harvesting their crops slowly and laboriously with sickles and other hand implements, should consider the possibilities of a small and hand-propelled harvesting machine recently invented by an Australian, Mr. G. E. Poynter.*

The machine, which is a pneumatic stripper-harvester with power-driven beaters, is relatively small, inexpensive to make and easy to maintain. It could even be constructed by the farmer himself at a cost of less than £A100.

It has been estimated that this machine, if used for the stripping of 5-15 acres, could cut the time spent in reaping with a sickle by at least half.

The main operating part of the machine, which resembles an oversized carpet sweeper, is a comb 2 ft. wide, over which is mounted a set of six fan-type beaters attached to a horizontal spindle. This comb can be raised or lowered by a simple screw lift to suit different stalk lengths.

The beaters turn with a speed of up to 2,000 revolutions a minute and are powered by a 1.3-h.p. *Villiers* four-stroke engine. They can strip the finest or the coarsest of seed with ease and as neatly as if each stalk were individually snipped. The air draught created by these beater blades blows the seeds and other particles up a chute and into a container at the rear of the machine.

The machine has three wheels; the front wheels, being large, make it easy to push and the small swivel wheel at the rear gives easy steering. Its overall weight is about 200 lb., but it can be handled with ease.

This harvesting machine is, of course, only suitable for rice harvesting in dry conditions; it may also be used for barley, rice and other grain crops. Its advantages are its low cost and ease of manufacture.

The Australian Department of Agriculture has carried out extensive tests with the machine at the Victorian State Research Farm at Werribee, and the verdict is that it promises to fill a long-felt need of small farmers, particularly in the more backward and primitive areas of the world.

Photo: Australian News & Inf. Bureau

The newly-invented stripper-harvester is so small and simple that a woman can handle it with ease

* Machine Engineer, Victorian Soil Conservation Authority, Melbourne.

Exports from Colonial Countries

The Report on the Colonial Territories for 1959-60 has just been published by H.M. Stationery Office, price 6*s.* 6*d.* According to the report, world prices for a number of raw materials, including rubber, sisal and copra, all improved in 1959, but cotton prices were lower. For a number of tropical foodstuffs, however, expansion in demand has not matched increased world supplies and prices have tended to fall. Included in this group were cocoa, coffee and free-market sugar. Groundnut prices were higher than in the previous years.

The large increase of about 12% in the volume of primary products exported from the territories in 1959 is in marked contrast to the slight increases which occurred between 1956 and 1958. This is mainly due to increased exports of copper, cocoa, rubber and timber, although there were small increases in a number of other commodities, including coffee, rice and sugar. The main decrease was in the export of groundnuts from the record levels of the previous year.

African Agricultural College

Chibero College, where Africans will, for the first time in the Federation of Rhodesia and Nyasaland, be able to take a full diploma course in agriculture, opens its doors to the first 15 students in October 1961.

An advisory committee of 13, which will help the Minister of Agriculture in the setting up of the college, is headed by Lord Acton. The committee consists of European and African agricultural leaders from all three territories of the Federation.

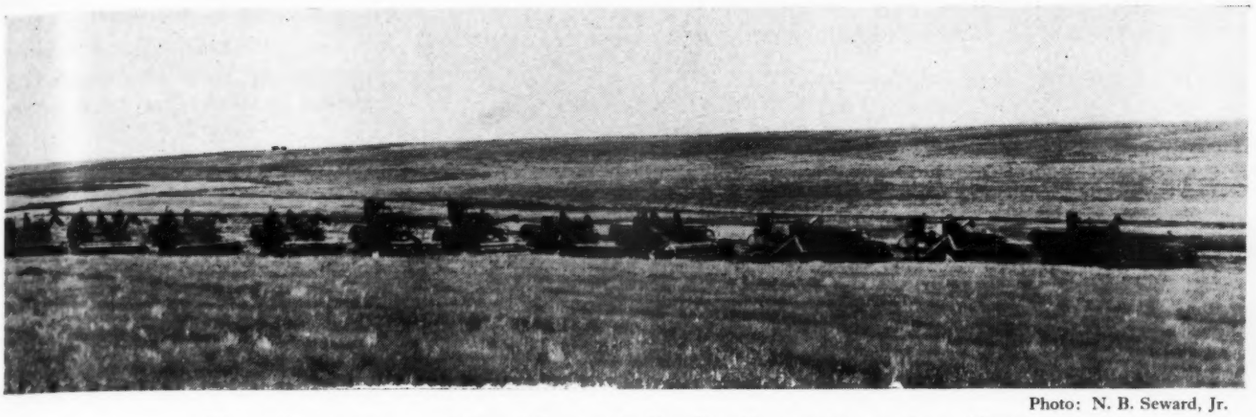


Photo: N. B. Seward, Jr.

Harvesting 5,000 acres of linseed flax on the Vee-Bar-Vee ranch in southern Alberta

Flax in Canada

W. G. McGREGOR*

Flax, Linum usitatissimum, *is now mainly grown for the valuable drying oil contained in its seed; the straw is sometimes used for making cigarette and other fine paper. The crop does best in the cooler regions; it is not suited to the tropics, except at high elevations.*

THE total cash value of Canada's flax crop in recent years has averaged from $50-60 million and ranks in value after wheat, oats and barley. The bulk of this crop is grown in the Prairie Provinces and within the last few years flax has risen in popularity because of the difficulty of marketing wheat and coarse grains.

From fibre to oil

The history of flax in Canada dates back over 300 years. The kind of flax grown by the early settlers is believed to have been a short fibre type. In periods of war, such as the American Civil War and World Wars I and II, the demand for fibre on world markets stimulated production and the fibre crop flourished. However, in recent years, through competition with modern synthetic products, fibre flax has disappeared as a commercial crop. It is questionable whether this type will ever again be of economic importance. Flax is now grown for oil.

Linseed production, stimulated by the establishment of a seed-crushing plant in Ontario in 1864, was first introduced into Western Canada about 1875. The ability to yield well on virgin soils and the absence of weeds in newly developed areas encouraged the extension of the acreage. Production reached a peak of 26 million bushels in 1912, which was not exceeded until 1954, when over 34 million bushels were produced. The 10-year average for the period 1950-59 was 16,897,700 bushels.

Flax is well suited to Western Canada. It is grown from the international boundary, north to the Peace River area. About half the production is in Saskatchewan, with the remainder about equally divided between Manitoba and Alberta. The average yield for the past 10 years was 9.6 bushels per acre, but recently provincial averages have exceeded 13 bushels per acre in some seasons.

Disease problems

Destructive diseases have been among the chief problems of flax production in Canada. At one time flax wilt, *Fusarium lini,* threatened to wipe out the crop. Fortunately, the cause was determined and resistant varieties developed. Now all introductions and hybrids are passed through wilt nurseries before they are advanced to yield trials.

Following the drought of the thirties, flax rust, *Melampsora lini,* became a menace. At the beginning of World War II all commercial varieties were susceptible. Plant breeders, already aware of this situation, had located sources of resistance and used this material in their breeding programmes. Genes for resistance to all known races found in North America have been incorporated into the existing varieties. The change-over to resistant varieties is complete, except for a very small area in the north, where very early-maturing varieties are necessary.

The pasmo disease, *Sphaerella linorum,* has been found in Manitoba since 1940. Usually it is not abundant until late in the season. By that time the crop is well advanced and escapes serious injury. No satisfactory parental

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Laying down variety trials of linseed flax at the Plant Breeding Research Station

source of resistance is known. A number of varieties are more tolerant than others and these are being used in the plant breeding programme to obtain increased resistance.

Aster yellows, a virus disease, was first recognised as being fairly widespread in flax fields in 1953. During 1957 it was widely prevalent, and quite destructive in Manitoba, and present, though less destructive, in other provinces. Its prevalence is associated with the relative abundance of the insect vector, the six-spotted leaf hopper, *Macrosteles facifrons*, which originates in the south and migrates northward in the spring with southerly winds. Differences in susceptibility of varieties have appeared and studies are being directed to obtaining a more detailed knowledge of the disease.

Seedling blights caused by several different fungi, most of which are soil-borne, are frequently present. These organisms attack flax seedlings before, or just after, they emerge from the ground. They appear to be favoured by warm, moist, well-worked land and are particularly troublesome where flax is sown after the summer fallow.

Flax threshed under dry conditions may have as high as 50% of the seeds cracked or showing minute fractures in the seed coats which are often difficult to detect. While seed injured in this way may germinate, it is important to protect it with a fungicide against soil-borne organisms which would impair germination. Seed treatment with an organic mercury compound just prior to seeding is a common practice in Canada.

Cultural problems

Flax is grown under a wide range of soil and climatic conditions in Canada, but does best on a clay loam soil. The practice of sowing flax on stubble has increased. This is due to several factors, among them being: (1) the efficiency of sowing with a drill attachment on a one-way disk; (2) the warm soil and quicker growth on stubble as compared with summer fallow; and (3) the weediness of most fallow requiring special tillage and the extra moisture in fallow delaying maturity.

Weed control

The flax plant is a poor competitor with weeds, which reduce yields of seed and foul the straw. Tillage practices have done much to produce conditions to ensure good crops, and it has been found, too, that stubble land disked in August produces a cleaner crop. Flax production has also been improved in recent years by the use of weed-control chemicals. The flax crop has the advantage that it is tolerant to herbicides that kill both grass weeds and broad-leaved species.

The herbicide recommended naturally depends upon the type of weeds present. Flax may be sprayed from the time it is 2 in. tall until the bud stage, but it is better to apply treatment when the weeds are small. MCPA† is used for broad-leaved weeds and TCA‡ for grass weeds. Some damage is done to the flax, but the reduction in yield, if the chemicals are correctly used, is much less than that which results if weeds are allowed to grow to maturity.

Varieties of flax

Flax varieties have changed markedly over the years. Farmers not only have

† 2-methyl-4-chlorophenoxyacetic acid.
‡ Trichloracetate.

Variety trials of linseed flax

a choice between early- and late-maturing types, but also a choice of disease-resistant varieties within these categories. Flax is frequently seeded after the seeding of other grain crops has been completed. Based on experimental tests and the experience of farmers, early-maturing varieties are better adapted to late planting than late-maturing varieties. Early-maturing varieties occupied about 75% of the flax acreage in Manitoba in 1959, and 50% and 38% in Alberta and Saskatchewan respectively.

Harvesting and storage

Swathing and the use of the pick-up on the combine is the most common method of harvesting. In wet seasons, or when seeded late, second growth is a problem and plants will continue to bloom until quite late in the autumn. Under these conditions harvesting is difficult until a light frost dries up the plants and any weeds. If free from weeds and evenly matured, flax makes a good crop to harvest by combine directly, as it does not shatter easily.

Flax seed cannot be stored safely if the moisture content is over 10.5%. Unless absolutely necessary, flax should not be threshed until the moisture content has been reduced, for in some of the drier areas, flax seed is easily damaged in threshing. Broken, cracked or chipped grains cause trouble in processing and permit the entry of disease organisms. Cylinder speed and concave clearance, therefore, need to be carefully adjusted. The straw is baled in some localities and processed for paper stock, to be used in the manufacture of cigarette and other fine papers.

Factors of quality

Flax is now grown primarily for the oil, and so more emphasis has been placed on this aspect, since the seed is the most valuable part of the plant. The traditional use of linseed oil in protective coatings depends on the fact that it dries rapidly. Ability to dry is measured by iodine value (I.V.). Although the oil content and the I.V. are genetically controlled, they are also influenced by environment. Experimental studies have indicated that varieties produced in the cooler northern areas have a higher oil content and I.V. It is for this reason that Canadian flax seed has the highest quality of any sold on world markets.

The drying properties of linseed oil are due to the presence of certain unsaturated fatty acids, particularly linoleic and linolenic. The type and quantity of the individual fatty acids are actually being used as a factor in the breeding of new varieties.

Research

Following the organisation of the Dominion Experimental Farms, the first breeding work with linseed flax was undertaken in 1904. The objectives were, firstly, to find varieties which matured early enough to be grown in Western Canada and, secondly, to study disease resistance and quality. Although the Research Branch of the Canada Department of Agriculture takes a lead in co-ordinating flax research, considerable work on various problems has been done by the universities in each of the Prairie Provinces. Annual meetings in February, under the auspices of the National Research Council of Canada, Associate Committees on Plant Breeding and Grain Research, provide an opportunity for research officers to meet and discuss data obtained from co-operative trials.

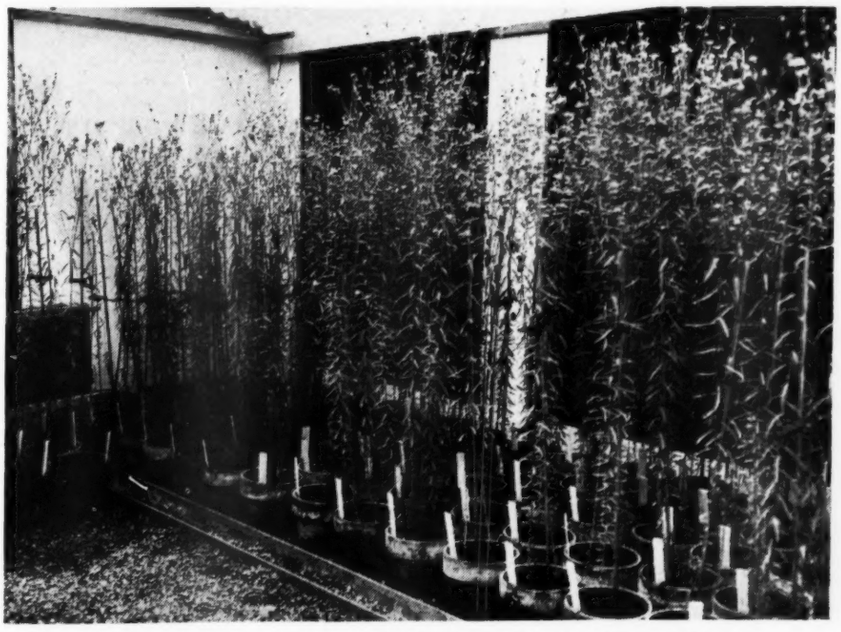
Variety trials, begun in 1935, were expanded to include all co-operators and cover all areas of the three provinces. They provide extensive data on maturity, disease resistance, quality and yield. No variety is released without having been tested in these replication nurseries.

Grading and marketing

Linseed is marketed under official grades of the Canada Grain Act based on soundness and cleanness. First grade flax must not contain more than 12½% damaged or broken seed and must be commercially pure. Straight grades must not contain more than 10.5% moisture.

Overseas trade

Canada crushes approximately 3.5 million bushels for home consumption, but in recent years the export of linseed has become more profitable. Most of the demand has come from Europe, with the U.K. as the best customer followed by France, Belgium and, Japan. Since European buyers prefer to do their own crushing, the exports have been mostly in the form of flaxseed. In the past 20 years, Canada's part in the world trade in flaxseed has changed from that of an importing country to an exporting country supplying about 30% of the total entering world trade.

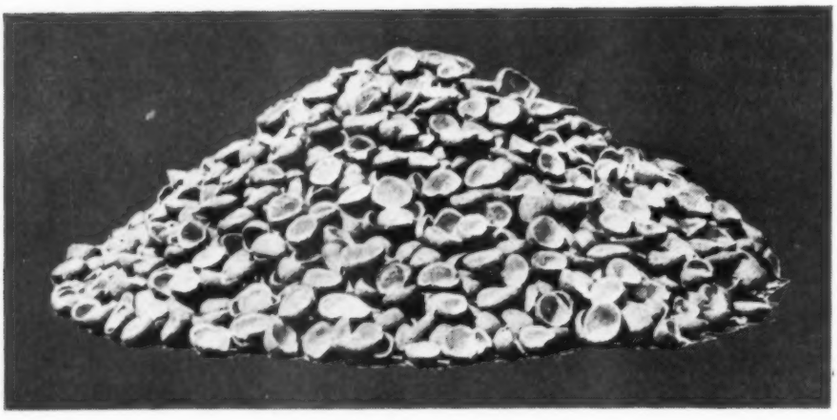


Flax experiments in the growth chamber at the Genetics and Plant Breeding Research Institute, Ottawa

The last three photographs in this article are by the Genetics and Plant Breeding Research Institute, Canada Department of Agriculture, Ottawa

Determination of M

The Grading of Copra



Copra—the meat of the coconut

A MEETING was held at the Tropical Products Institute under the chairmanship of Mr. F. C. Cooke, formerly Director of the Coconut Research Institute of Ceylon and at present Editor of WORLD CROPS, to discuss the field grading of copra with special reference to the rapid determination of moisture. It was attended by the Director of Agriculture, Zanzibar, by representatives of trade interests concerned with copra in the U.K. and by representatives of the Tropical Products Institute and the Pest Infestation Laboratory. The meeting agreed unanimously on the following statement:

Work has been done over many areas by various agencies to improve the quality of copra and to determine the financial losses which are incurred by countries producing inferior material. There is an obvious loss due to the presence of free fatty acids, discoloration and extraneous matter. There is also a hidden, and often much greater, loss due to the depredation of insects and the material decomposition caused by moulds and bacteria. As the buyer naturally only pays for the weight and quality he receives, the hidden loss is solely borne by the producing countries. The meeting therefore concluded that:

1. Moisture is a prime factor in the deterioration of copra and the meeting strongly supported the statement in the Report of the Second Session of the Working Party on Copra Quality and Grading, FAO Group, on 'Coconut and Coconut Products',* regarding the moisture content of copra.

2. The moisture content of copra should be reduced to a safe level as early as possible after opening the nuts, and for the purposes of early rural trading this level should be not more than 9%.

3. Whilst it was appreciated that many governments have already set up satisfactory trading systems, the meeting considered that they could profitably consider to what extent they are in a position to ban all trading in copra with a moisture content higher than 9%.

4. Where it is at present impracticable, or undesirable, to ban such trading, an attempt to achieve similar results by demonstration and education should be made.

5. The meeting appreciated that there are rough and ready field methods for the determination of moisture, but these could, with advantage, be supplemented by a more precise and easily operated meter, which can be simply and convincingly demonstrated.

6. Having considered various rapid methods available, it seemed to the meeting that the P.I.L. meter, which determined fairly accurately the water content of copra between about 4 and 10%, was eminently suitable. They therefore recommended that a number, say about six, instruments be made available for field trial in selected Commonwealth countries.

* FAO Report, CCP/59/1, Aug. 1959.

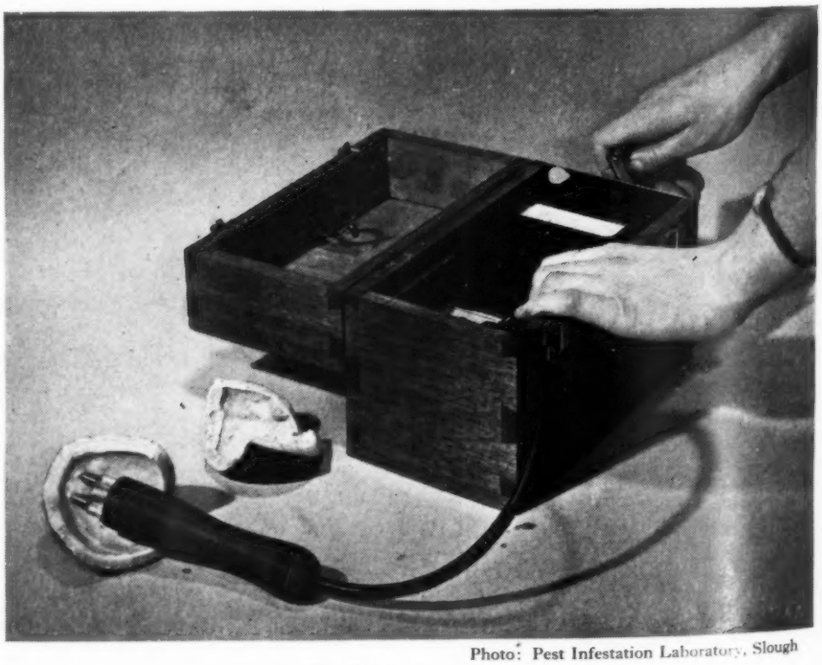


Photo: Pest Infestation Laboratory, Slough

The P.I.L. meter in use

Moisture in Copra

The P.I.L. Moisture Meter for Copra

G. AYERST, B.SC.*

Moisture content is the most important single factor affecting copra storage, but it is difficult to measure accurately in the field. A new portable meter for this purpose is described below.

FOR safe storage, copra must contain less than 6% of moisture. At above about 10% moisture content at tropical temperatures, serious mould damage occurs in a few days and the product is more subject to attack by insect pests. It is obviously important to measure the moisture content soon after drying, so that storage of highly perishable moist copra can be avoided.

Existing methods

The moisture content of copra is usually defined as the percentage weight loss found when a prepared sample is dried to constant weight at 100°C or as the percentage of water obtained by distillation over toluene. Although these methods are routine in some laboratories, they are time-consuming and need to be carried out under expert supervision to give accurate results. A number of secondary methods, based on measurements of electrical properties or on accelerated drying, have been devised, but all of these require some preparation of the sample and some can only be used successfully by skilled operators.

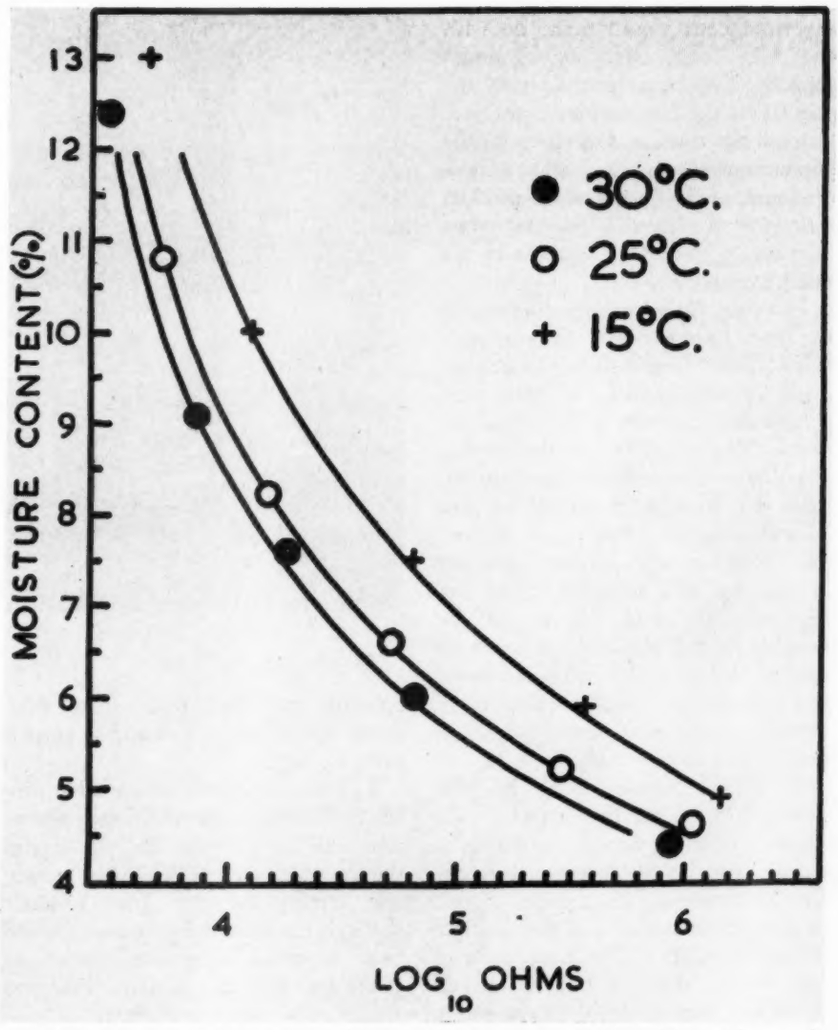
In the field, moisture content is often estimated subjectively by observation of the texture, appearance or inflammability of the copra. This approach can give useful results, but it depends on an agreed standard of grading which is difficult to maintain without reference to objective tests.

The P.I.L. meter

The purpose of developing this instrument was to produce an easily portable meter which would give instantaneous readings and could be used by relatively unskilled operators. To take a reading a pair of spikes are pushed into a piece of copra and the electrical resistance between them is measured with a hand-generating meter of robust design.

The meter has been calibrated against the standard oven method, using freshly prepared copra and carrying out all the tests at constant temperatures (below). As might be expected, individual pieces of copra vary slightly in their electrical characteristics and different pieces of copra in the same batch have different moisture contents. Because of this variation it has been found necessary to take readings on about 10 pieces of copra in order to obtain a reliable figure for the average moisture content of a sample. With laboratory-prepared

* Pest Infestation Laboratory, A.R.C., Slough, Bucks.



Calibration of the P.I.L. copra-moisture-content meter. Each point on the graph represents the mean from about 18 half nuts

copra this average will be within ±0.5% at 5% moisture content and ±1% at 10% moisture content. Trials in Jamaica have suggested that the accuracy with commercial copra is about the same.

The present meter is calibrated at 30°C, which should be suitable for most tropical territories, and there is a simple correction for other temperatures.

Limitations and advantages

In designing this meter to achieve speed and simplicity in measurement some qualities have had to be sacrificed. The range of moisture content which can be measured is limited to that most often encountered in practice and the accuracy, although adequate for most practical purposes, is not so great as can be achieved by good laboratory determinations. A peculiarity of the meter is that accurate readings cannot be made on copra removed directly from a drier; it should be stored for at least a day before testing.

In compensation the meter has the following important advantages: it withstands rough handling remarkably well, it is completely portable, weighing about 6 lb., and there are no batteries to fail. A set of 10 readings can easily be made and averaged in less than three minutes.

Future prospects

So far only a small number of these meters have been made. They have been tested in England and one meter has been tried successfully in Jamaica.

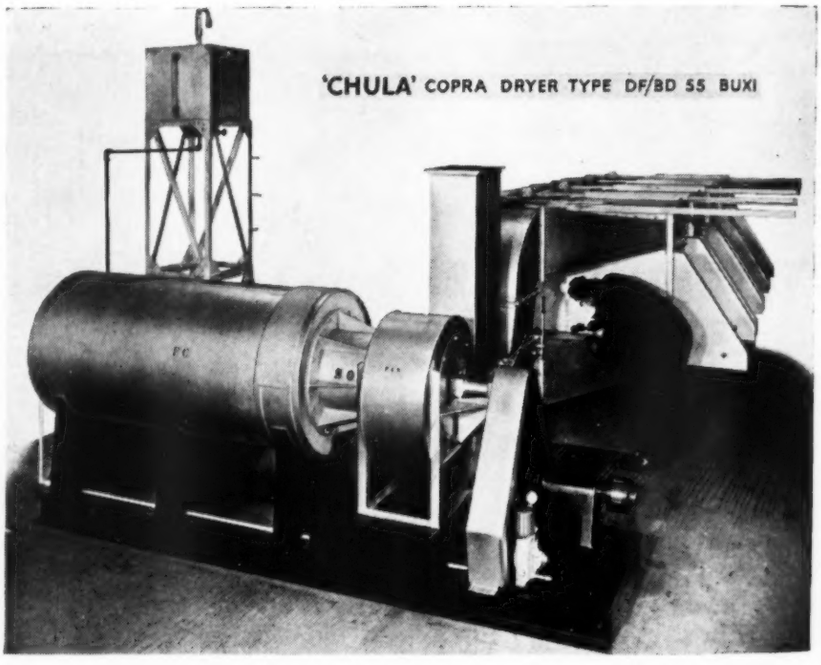
Six more meters are now available to be tried in copra-producing areas and future developments will depend largely on the results of these trials.

Drying the Chula Way

In the early days of the Ceylon type kiln, an economical estate manager or superintendent would make do with one kiln long after its optimum capacity had been passed, with the result that the hot air would not pass through the thick bed of copra on the overloaded kiln. This was a false economy, as the quality of the product seriously deteriorated as the crops increased without any increase in the number of kilns.

Tyneside Foundry and Engineering Co. Ltd. have recently announced a new 'Chula' copra-drying machine, made up of a number of units each able to give 1,500 lb. of dry copra per day. The capacity of the drying chamber can be increased as required from one to nine chambers to give outputs of from 1,500-13,500 lb. per day. This flexibility is most important in the case of a new plantation just beginning to yield, for it will be possible for the grower to increase his capital outlay as his crop increases and increase his rate of production of copra without any deterioration in quality due to overload.

This new 'Chula' is an oil-fired drier. The operative part of the machine is an air heater, consisting of an oil burner with thermostatic control, a fan driven by a diesel engine or an electric motor, and the multiple drying chamber. The nine units of this drying chamber can be cut off from one another by division plates, which do not interfere with the flow of air. The air flow can be directed upwards and then reversed to pass down through the copra and so ensure even drying.



The nine units can be loaded at different times to allow continuous operation and so prevent the pre-drying delays which can so seriously reduce the quality of the final product through bacterial decomposition while 'wet' copra is being accumulated, as is the case with other driers. This also means continuous employment.

This new design will have additional appeal to co-operative societies, to farm syndicates, and to the copra merchant whose business is to dry nuts sold to him. The kiln can grow as the society grows and the crop brought in by individual growers can be treated in separate chambers if so required.

The makers claim that this machine will dry the copra to 7% moisture content, and they claim further that if the hot copra is stored in a dry place it will mature and harden, a loss of further 2% in the next 24 hours. This maturing process is, of course, assisted by the heat held by the oil in the copra.

Improved Ploughs for Dryland Farming

H. J. HOPFEN*

THE main purpose of tillage is to assist the natural processes which produce soil conditions favourable to the germination of seeds and the subsequent growth of the plants. For this purpose, implements are used to break the soil, control soil moisture, temperature and air circulation, and bury surface vegetation and stubble.

These natural processes vary considerably with different soil and climatic conditions and tillage requirements vary accordingly. Generally speaking, the hotter the climate, the more intensive are the natural processes; consequently less tillage stimulation of the soil is needed. Conversely, the cooler the climate, the more the soil needs stimulation and inversion to produce a good tilth.

The plough is without doubt the most important tillage implement. Different tillage requirements have led to the development of various types, which fall roughly into two categories: mouldboard ploughs, with a soil cutting-turning action; and breaking ploughs, which break up the soil without inverting it. Both groups of ploughs have special advantages for the conditions for which they have been developed, but they do not fulfil their purpose, if applied under extremely different conditions.

Mouldboard plough

The mouldboard plough is the standard implement for the temperate zones, particularly where frost may occur. It cuts and turns the soil and thus stimulates freezing during the winter, faster drainage in early spring, the decomposition of organic matter, and the destruction of weeds. In lifting the soil from the furrow bottom and turning it aside it clears the furrow for the next turn and enables a field to be tilled in one instead of the repeated crosswise operations necessary with the breaking plough of the desy type.

This advantage of the mouldboard plough has led many people to use it in dryland farming also. The negative results of inversion ploughing in such conditions are soon apparent, viz., loss of soil moisture and erosion of the soil by wind.

Breaking plough

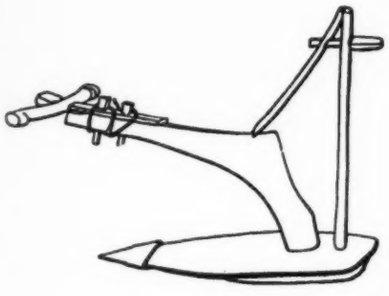
Breaking ploughs, which do not invert the soil, are more appropriate to conserve moisture and by leaving dead vegetation on the surface they help to prevent soil erosion by wind. Their low cost, simplicity of design and ease of operation are also advantages which should not be underestimated.

Their disadvantages, such as the need for repeated crosswise tillage to obtain a good tilth and insufficient capacity to eradicate weeds, do not justify their substitution with mouldboard ploughs in dryland farming areas in the tropics. Their positive qualities, however, justify the attempt to overcome their faults by making improvements.

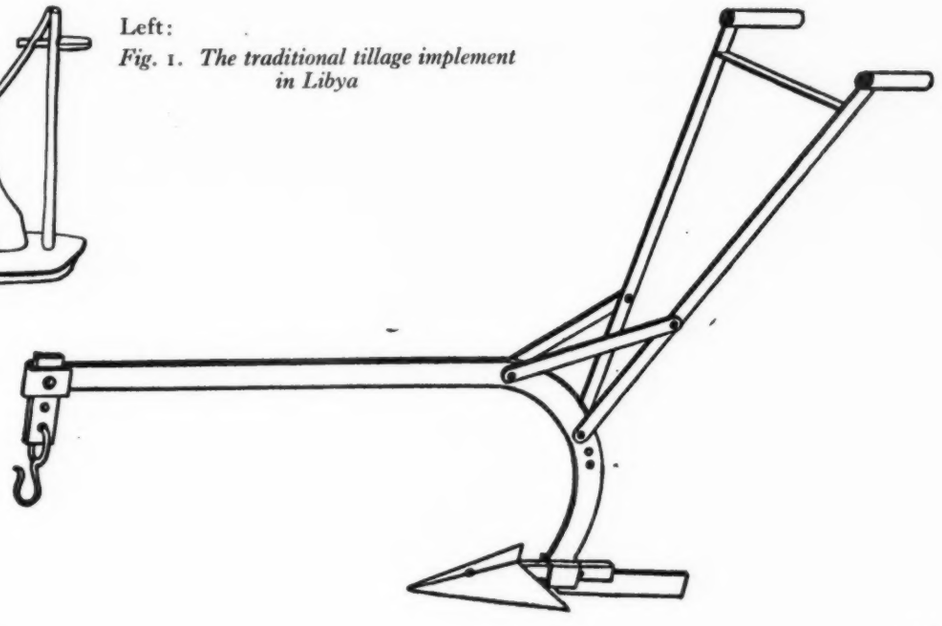
Multi-purpose implement

In Libya the main cereal crops for human consumption are wheat and barley, both grown under dryland farming conditions. The local tillage implement mainly used is a small wooden breaking plough (Fig. 1) drawn by one animal, usually a horse. The soils here vary from light sandy to heavy loam types. Shallow ploughing, ridging and the control of weeds, mainly Bermuda grass, are the main

* Small Tools and Implements Specialist, FAO



Left:
Fig. 1. The traditional tillage implement in Libya



Right:
Fig. 2. Improved tillage implement

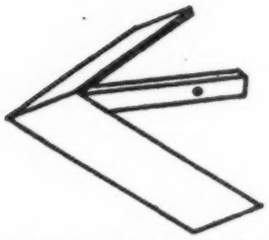


Fig. 3. The 'mahacha' or weeding sweep

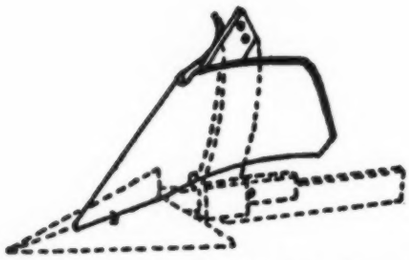


Fig. 4. Traditional tillage implement with double mouldboard attachment

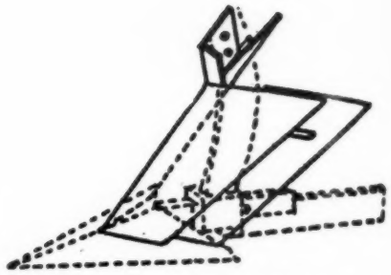


Fig. 5. Expandable ridging body

tillage operations. The peasant farmer normally owns the plough which he uses for this work, but a *mahacha*, an animal-drawn weeder with a large V-shaped sweep to undercut the weed roots, is usually shared by several farmers.

The problem of the FAO Implement Project was to provide a multi-purpose implement similar in operation, draught power requirement and price to the local one, but solid and able to perform efficiently both the tillage and the weeding operations.

Fig. 2 shows the construction of an improved plough, evolved by the FAO team in Libya. The implement is made entirely of steel and the plough framework has a sheath at the bottom which carries the exchangeable working parts; the rudder—the extension at the rear of the ploughshare—ensures steady guidance. The body has two handles because the Libyan farmer prefers this, but one handle would really be quite sufficient.

A separate ploughshare with a rectangular rod is fixed to the plough bottom and held in position by a pin without any bolts. It can be exchanged with a weeding sweep (Fig. 3), the so-called *mahacha*.

The ploughshare can be provided with a double mouldboard (Fig. 4) or with an expandible ridging body (Fig. 5). Used with the share alone, the implement serves for shallow ploughing immediately after harvesting; with share and double mouldboard it ploughs deeper, and with share and ridger it makes furrows.

This multi-purpose breaking plough, now successfully introduced in Libya, is likely to prove a useful implement also for dryland areas elsewhere.

Cost of Corrosion

Iron and Steel in Agriculture

The science of corrosion is a vast subject and its economic consequences are staggering. For the U.K. alone, the cost is believed to be about £600 million a year. Thus it follows that even slight improvements in preventive measures can result in significant savings in materials and manpower.

Almost everyone associated with agriculture is concerned with the problem of corrosion, and those of our readers who are visiting Britain this year must make a point of visiting the **Corrosion and Metal Finishing Exhibition** which takes place in London from 29 November to 2 December and is to be held in the Empire Hall at Olympia, London.

This year's exhibition will be the biggest demonstration of all the products and services that are available to fight corrosion ever seen. Of special interest to producers of agricultural chemicals, will be a display of corrosion-resistant plant and equipment in plastics and special metals. Linings and coating to prevent corrosion will also be prominently featured and, of course, there is paint, perhaps the most widely used protectant of all. Then there will be ceramics, glass and other non-metallic materials, methods of metal cleaning and plating, cathodic protection, anti-corrosive packaging materials and anti-rust compounds and processes of rust proofing. In fact, every conceivable means of fighting corrosion will be found at Olympia.

The National Chemical Laboratory has been extending its work on bacterial corrosion and is studying the factors affecting the aggressiveness of soils, and they, too, will be exhibiting at the Exhibition. A great deal of iron and steel is used in farming in the form of buildings and in mobile and stationary machinery and equipment, so that this is a subject of immense importance to agriculturalists in all parts of the world, where soil and climatic conditions are so widely different.

The distinguished chemist and industrialist, Sir Alexander Fleck, President of the Society of Chemical Industry, has consented to open the Exhibition, and the ceremony is to take place at 11 a.m. on the 29 November.

Admission is free on presentation of a trade or profession card, but planters, farmers and scientists wishing to attend may apply to the organisers for free tickets, which will be available from **'The Corrosion and Metal Finishing Exhibition'**, 9 Eden Street, London, N.W.1.

Our Roving Correspondent

Mr. W. Leonard Hill, Chairman of the Leonard Hill Technical Group, will undertake an extensive tour of India and Ceylon in January and February 1961.

Control of Citrus Pests in Cyprus

R. MICHAELIDES* and S. PREVIS†

This article describes the existing methods of the control of citrus pests in Cyprus and goes on to consider the possibilities of using the latest insecticides and acaricides.

THE production of citrus is of great importance to the economy of Cyprus, as this crop is one of her main exports. A considerable expansion in production has taken place since the end of the war and, whereas the annual production then was approximately 100 million fruits, now over 300 million are produced annually. About 80% of the fruit produced is exported, mainly to the U.K., while the remainder is either consumed domestically or is processed in the local canneries.

Since the economy of the island is so dependent on its citrus exports, it is of the greatest importance to use the most up-to-date field practices so as to obtain fruit which is entirely free from blemishes. Great advances have been made and in this article it is proposed to summarise the problems of the control of citrus pests and indicate the present trends resulting from the development of new agricultural chemicals.

Picking oranges in Cyprus

New shoots, free from bud mite infestation, which developed after spraying with chlorobenzelate

The main pests

Although there are a number of pests which cause damage to citrus trees in restricted localities, the main pests of citrus in Cyprus are the Mediterranean fruit fly, *Ceratitis capitata;* citrus red scale, *Aonidiella aurantii;* citrus rust mite, *Phyllocoptruta oleivorus;* and, on sour lemons, citrus bud mite, *Aceria scheldoni.*

Until 1945 the Mediterranean fruit

* Agricultural Officer, District Agricultural Office, Department of Agriculture, Nicosia, Cyprus.

† Agricultural Superintendent, District Agricultural Office, Department of Agriculture, Nicosia, Cyprus.

fly was responsible for considerable damage to citrus, particularly in areas of early season production, and it was not until 1953 that recommendations were made to the growers regarding the then new insecticides, dieldrin and malathion. With the increasing use of these insecticides and later the employment of 'Dipterex', infestations of Mediterranean fruit fly do not now present a serious problem, so long as the necessary control measures continue to be applied.

Citrus red scale

Citrus red scale, which infests all types of citrus trees, can also be responsible for severe damage, a moderate infestation being capable of destroying several branches, if left uncontrolled. Scales feed on all parts of the tree, especially on the younger branches, leaves and fruit.

The measures at present recommended for its control are spraying at high pressures with an aqueous emulsion of summer medium-grade white oil at a concentration of about 1½-2% during July and August. Where white wax scale, *Ceroplastes rusci*, carob moth, *Myelois ceratoniae*, or mealybugs, *Pseudococcus citri*, are present, the addition of parathion to the oil spray is recommended.

These control methods have proved very effective, but they have certain disadvantages: it is necessary to ensure that the correct concentration is employed, that high-pressure spraying is used and that thorough and complete cover of the trees is achieved. It has also been found desirable to irrigate the crop three days before spraying.

Citrus rust mite

Citrus rust mite was first noticed in Cyprus in 1941. It has gradually spread to all parts of the island and is now becoming a pest of economic importance in certain areas. The mites pierce the epidermal cells of the fruits and leaves, and the fruit assumes a silver appearance with a thickened rind; in very heavy attacks a brownish-black appearance develops. Infested fruits are usually smaller and during dry weather fall from the trees prematurely; infestation of the tree causes a reduction in vitality, with occasional defoliation, and this renders the trees particularly susceptible to cold weather.

As a control measure, dusting with sulphur has proved effective, and regular dusting, commencing in May and continuing until the harvest, at rates of about 27-45 lb. per acre, is recommended. Sulphur dusting must not be carried out, however, when the temperature is above 95°F or when the atmosphere is humid. Wettable sulphur may also be used, but, since sulphur is not compatible with white oil, an interval of 30 days should elapse between the spraying with oil and spraying or dusting with sulphur. Scorching of citrus fruits, rendering them unsuitable for export, has been caused by failure to follow this recommendation.

Citrus bud mite

Citrus bud mite attacks sour lemons, oranges, grapefruits and other citrus varieties, but causes severe injuries only to sour lemons. The mites feed within the buds of blossoms and young fruits, and trees attacked produce a little new growth, with curled and distorted leaves and malformed fruits.

Spraying in July with white medium summer oil at 1½-2%, in a similar way as recommended for the control of red scale, has given partial control, but no complete method of control has been available.

Recent investigations

Although effective control measures for red scale and rust mite and partial control measures for citrus bud mite have been established, the methods of control described above have certain disadvantages and it would be in the interests of the industry if other more effective pesticides could be found. With this in mind, a number of the newer insecticides and acaricides have been given a preliminary testing.

(a) On red scale

Comparative trials for the control of citrus red scale have been carried out using white oil, white oil plus parathion, and the new organo-phosphorus insecticide, 'Rogor 40'.‡ 'Rogor' was first employed for the control of the olive fruit fly, *Dacus oleae*, and experiments carried out in Greece have indicated that it is effective for this purpose and has a long residual effect. Observations made in all the trial plots have shown that 'Rogor' is effective and may be more effective than white oil; crawlers of red scale were not present on trees treated with this insecticide.

'Rogor' has a number of advantages over white oil, being highly effective against citrus red scale and having a relatively long residual action, controlling other pests, such as Mediterranean fruit fly (although more information is required on this subject), and being safe and not causing damage to the trees. In addition, being systemic in action, it does not require the same skill and care in spraying as is necessary with white oil.

After these preliminary observations further trials were made to control red scale during the period July to November. From this work it has emerged that concentrations of 'Rogor' below 200 c.c. in 30 gal. of water are not effective. As the season progresses from July towards winter an increase in the amount of 'Rogor' up to 300 c.c. is required to control scale.

In addition to this work, a number of trees were also sprayed with malathion 50% wettable powder at the rate of 320 g. of malathion in 30 gal. of water. This treatment had a certain amount of success and 90% of red scale was killed. 'Rogor 40' was also included in this trial and the comparative results are shown in Table 1.

This series of trials also showed that 'Rogor' at the concentration used did not control citrus rust mite.

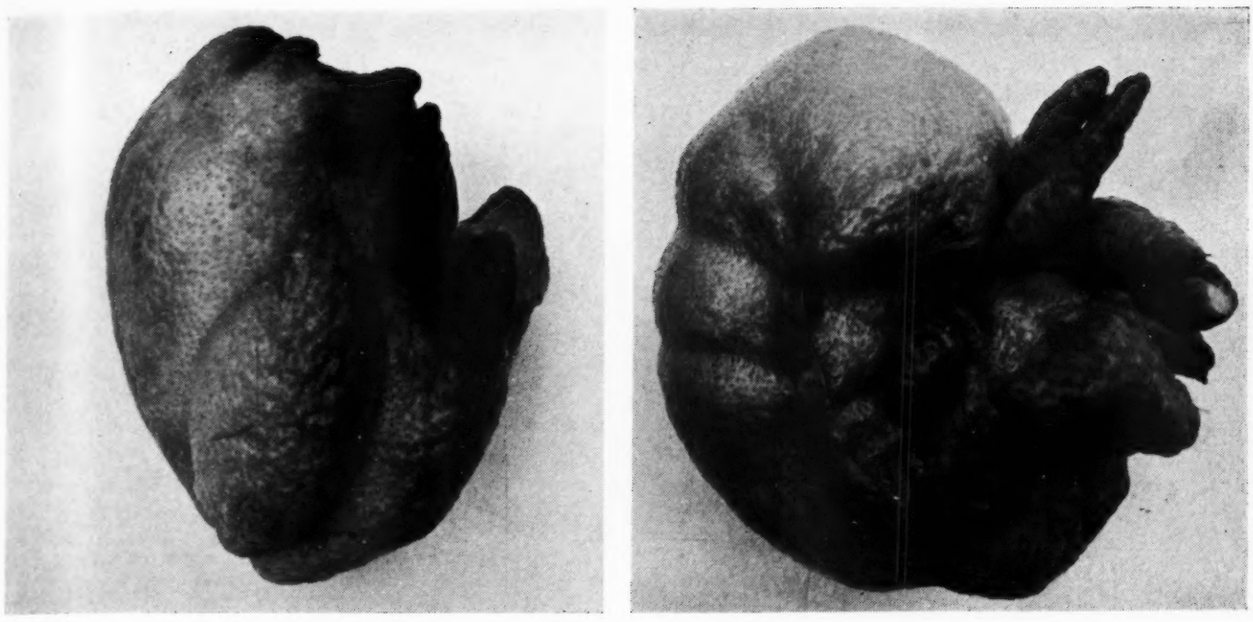
(b) On rust mite

Successful trials for the control of citrus rust mite were carried out using zineb. Zineb was developed as a fungicide, but it was observed that where it was applied it gave satisfactory control of rust mite. This led to the application of zineb on a wider area, both alone and mixed with white oil, and very good results were obtained. Zineb has certain additional advantages:

(1) It is a fungicide controlling a number of fungus diseases; (2) unlike sulphur, it does not have a scorching effect on citrus fruits and it is compatible with many insecticidal sprays, including summer white oil; (3) it contains zinc and thus helps to correct the zinc deficiency which is prevalent in Cyprus; (4) it has a residual action and gives effective commercial control for about 50-60 days.

The quantities used were 80 g. of zineb 65% in 30 gal. of water and

‡ 'Rogor 40' contains 0,0-dimethyl S-(N-methylcarbamoylmethyl) phosphorothiolothionate or 'dimethoate'.



Malformed lemons resulting from attack by the citrus bud mite

the trees were thoroughly sprayed.

A 3% zineb dust did not give effective control of rust mite, probably because its concentration was too low, and it seems that, if dusting is to be carried out, sulphur should be used.

(*c*) *On bud mite*

As mentioned previously, the treatment recommended for the control of citrus bud mite is the application of summer white oils because of their penetrating power. However, the results are not entirely satisfactory and the citrus bud mite still causes considerable damage to lemon trees and fruits, particularly in the north coast of Kyrenia district, the traditional sour lemon growing area. Therefore certain materials, including the specific acaricide, chlorobenzilate, were tested at three centres on trees infested with bud mite.

This treatment gave encouraging results and sour lemon trees sprayed with a solution of 120 c.c. chlorobenzilate in 30 gal. of water on 9 March, 1959, and again on 23 March, 1959, showed considerable improvement over the other trees. New shoots developed free from bud mite infestation, and the percentage of distorted fruits was negligible.

Similar treatment on the same dates at another site failed because all new shoot development was burnt off by frost. No concrete results were obtained from similar treatments with chlorobenzilate in a third trial on sour lemons because spraying was delayed.

From observations made so far, it appears that chlorobenzilate may control citrus bud mite infestation on sour lemons provided the correct time of spraying (and perhaps of spray concentration) is determined.

Table 1

Control of Citrus Rust Mite

Date of spraying, 31 August, 1959
Date of examination, 15 September, 1959

	Adults			*Crawlers*		
	Dead	*Alive*	% *of kill*	*Dead*	*Alive*	% *of kill*
'Roger 40' 200 cc. in 30 gal. water	420	22	95	303	16	95
'Roger 40' 100 cc. in 30 gal. water	343	44	88	347	39	91
Malathion WP 50% 320 g. in 30 gal. water	334	36	90	193	20	90

Summary

Some recently developed chemicals have been tested in Cyprus for the control of the three main pests of citrus. The conclusions reached were that:

'Rogor 40' effectively controls citrus red scale; the concentration of the spray solution should be progressively increased during the period July to November. Further investigation is needed to determine the precise dosage rates at varying times of application. Zineb, used as a spray, is very efficient for controlling rust mite and is already extensively used. Chlorobenzilate seems to control citrus bud mite on sour lemons, but further investigation is necessary to determine the correct dosage and the timing and frequency of application.

Heavy logs, light logs, long logs and short logs are slid onto the sleigh transporter with confident ease. The men are using a steel log hook—the right arm of all forest workers

Logging in Sweden

NILS-OLOF WESTBERG

THIS is the story of a small logging crew—the brothers Bertil and Robert Dahlgren, Lennart Lindstrom and Hilding Oloffson—who live and work together in the Norrland forests in the severe cold of the northern winters.

After some 25 years' experience of working in the deep snow and intense cold, with the thermometer reading far below zero for months on end, these four men at last discovered that the use of a tractor could take the torture out of their work. Formerly, when they used horses, it was cruel on both man and beast. Loads were much smaller, consisting only of some four or five logs, and even then they had to push the sledge to help the struggling horses through deep snow drifts.

They have now found that it is possible to do three times as much work with a *Fordson* 'Power Major' that they have now acquired, and they can haul between 1,200 and 1,400 cu. ft. of timber in a day. One snort from the diesel engine and the loaded sledge is off on its way to the collecting centre, with two of the team riding comfortably—one in the tractor cab and the other on the sledge—because the broad endless snow tracks now take a sure grip and pass comfortably over the soft snow with all the weight spread evenly over a large area.

While two of the team are engaged in bringing down and trimming the giants of the forest, the others load up the sledge and ride in comfort to the dumping ground. Arrived there, they loosen the chains and skilfully slide the logs one by one to the ground, using the steel hook, which is the 'right arm' of every forest worker.

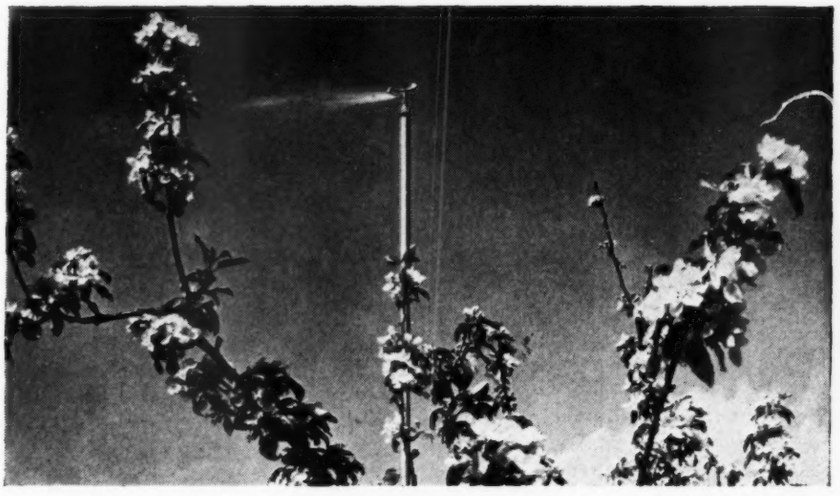
Photos: T. Röring

A Fordson Power Major, fitted with endless snow tracks, churns its way through the rugged, snow-covered country

Frost Protection for Fruit

The first permanent scheme in Britain for protecting fruit from frost by sprinkler irrigation went into operation in April this year on the farm of Mr. C. L. Bencard at Gorgate Hall, East Dereham, Norfolk.

The installation, by *Farrows*, of Spalding, has 1,035 yards of underground main which give protection from frost to 2 acres of blackcurrants and 6 acres of Cox's apples, using water from a 6-acre, 5-million-gal. reservoir—the largest farm irrigation reservoir in Norfolk. It is a dual-purpose scheme, as this permanent network can feed a further 142 acres of market garden crops through portable pipes and sprinklers, supplied from six hydrants.



Apple blossom undergoing frost protection by irrigation in a Norfolk orchard

Protection from frost is obtained by sprinkling with a fine jet whenever the temperature falls below 32°F. A contact thermometer in the orchard rings alarm bells at the farmhouse when the temperature reaches 34°F, and the pump is then turned on if there is a further fall.

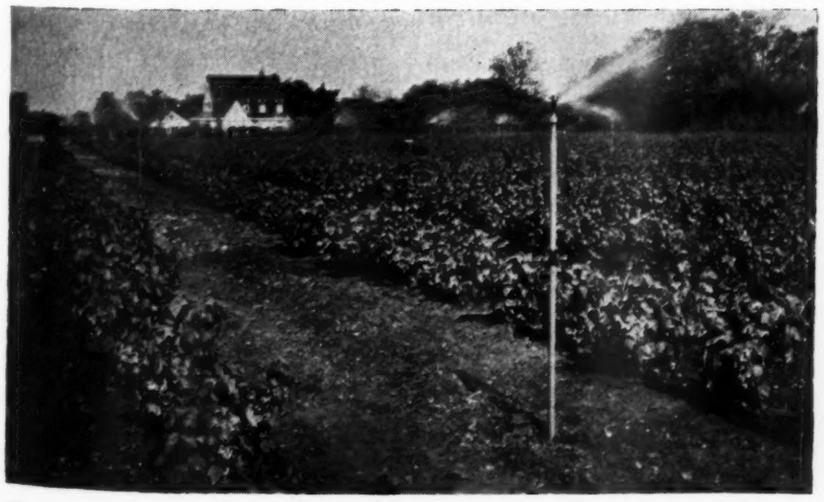
Spraying in the apple orchard is at the rate of 0.1 in. per hour, the figure recommended by East Malling and based on extensive research. Much less is known about sprinkling blackcurrants for frost protection, but Mr. Bencard is experimenting with a 50% higher rate of water application, *viz.* 0.165 in. per hour. Blackcurrants, because of their waxy leaves, are one of the most difficult crops to protect and a higher rate is necessary.

The new scheme will protect about a third of his apple acreage—and the blackcurrants as well—from frost and, with the ordinary irrigation which it provides in time of drought, will eliminate two of the most costly of natural hazards in farming.

The equipment used consists of a self-contained *Sigmund* HL6 2-stage pump driven by a *Ford* 59GE 6-cylinder O.H.V. water-cooled diesel engine. A 300-gal. fuel tank is coupled directly to the engine to guard against stoppages due to lack of fuel. There is also an attachment to enable fertiliser to be injected into the irrigation delivery main.

The Horticultural Advisory Officer for Norfolk, Mr. R. W. Kemp, N.D.A., gave a visiting party of farmers and advisory officers five rules for growers who might think of installing such a scheme. These were: (1) The sprinklers must be reliable and unfailingly start on their own. (2) The sprinklers must be close enough to give complete cover, even in wind. (3) Precautions against blockages in the sprinklers are vital. (4) The soil must be able to take quite large quantities of water at a time of year when it may contain a large amount already. (5) The effect on nutrition must be considered—sprinkling will take away a greater than usual amount of nutrients, especially nitrogen.

Mr. Kemp also explained the action of frost protection by sprinkling. The blossom was kept at 32°F by the latent heat released as the water froze upon it, for 1,000 gal. of water gave up as much heat, when it froze, as was released by 800 gal. of boiling water in the process of cooling. Thus it was essential to re-wet the blossom continually to stop it from cooling down, for it was extremely difficult to reverse the process once the temperature of the blossom was allowed to begin to fall below freezing point.



Two acres of blackcurrants under sprinkler irrigation to protect them from frost. Water is applied from 5-mm. nozzles at the rate of 0.165 in. per hour

Coming Events

Timber. — The 2nd International Timber Fair will be held at Basle from 1-9 October. Details from Mr. Paul Hagi, c/o Spoerri & Co. A.G., Schaffhauserstrasse 89, Zurich, Switzerland.

Plant Protection.—The Deutscher Pflanzenschutztagung Conference will be held in Freiburg from 10–14 October. Further information from Dr. Richter, Biologische Bundesanstalt fur Land- und Forstwirtschaft, Messeweg 11–12 Braunschweig, Germany.

Oils and Oilseeds.—A conference covering the production, processing, chemistry and utilisation of vegetable oils and fats is to be held from 13-16 October at Bari, Italy. Further information can be obtained from Dott. Eng. Borelli, Secretary of the Organising Committee, Borsa Merci di Bari, Corso Cavour 2, Bari, Italy.

Packaging.—An International Packaging Exhibition has been arranged in Paris from 14-23 October. Further information from Salon de l'Emballage, 40 rue du Colisse, Paris 8.

The Fresh Food Packaging Exhibition will be held from 1-4 November at Alexandra Palace, London. Particulars from Brooks Publicity Services, 6 London Street, Paddington, London, W.2.

Water.—A conference covering irrigation, drainage and water conservation, under the chairmanship of Mr. W. T. Price, Principal of the Harper Adams Agricultural College, is to be held at Cambridge on 18 October. Further details from Farm Intelligence Ltd., 42 Parliament Street, London, S.W.1.

Weed Control.—The 5th British Weed Control Conference will be held in Brighton from 7-10 November. The main session will cover the following subjects: Impact of Herbicides on Crop Husbandry; Weed Control in Arable Crops; Improvement on Pastures and Hill Grazing—Bracken Control; Problems of Advice and Education; Weed Control in Horticultural Crops; New Herbicides; Weeds of Waterways; New Techniques in Agriculture and Horticulture; Translocation and Fate of Herbicides in Plants.

Organisers of meetings, conferences and agricultural exhibitions are invited to supply information for this regular feature. This should be received by the Editor at least three months prior to the event.

Information and registration forms from the Secretary, British Weed Control Conference, 52 Bedford Row, London, W.C.1.

Corrosion and Metal Finishing.—The 1960 Exhibition will take place at Olympia, London, from Tuesday, 29 November, to Friday, 2 December.

Bookings are now being accepted and full information is available from the Organiser, *Corrosion Technology*, Leonard Hill House, Eden Street, London, N.W.1.

Agricultural Exhibitions

Germany.—An Agricultural Exhibition is to be held at Saarbrucken from 23 April-21 October. Further information from Ausstellungstechnische Leitung und Organisation Stadtverwaltung, Saarbrucken.

The National Agricultural Show takes place in Stuttgart from 24 September-2 October. Information from Stuttgarter Ausstellungs G.m.b.H., Am Kochenhof 16, Stuttgart-N.

Australia.—The Royal Agricultural Show is to be held in Perth from 30 September-6 October. Particulars from the Royal Agricultural Society, 239 Adelaide Terrace, Perth.

Switzerland.—The 'Olma' Agricultural and Dairy Show will be held at St. Gall, Switzerland, from 13-23 October. Further information from the Swiss Legation, Commercial Section, 18 Montagu Place, London, W.1.

Canada.—The Royal Agricultural Winter Fair will take place in Toronto from 11-19 November. Details from J. R. Johnson, Royal Coliseum Exhibition Park, Toronto 28.

The Canada Farm and Industrial Equipment Trade Show will be held in Toronto from 25-28 January, 1961. Information from the Exhibition Organisers, 40 Wellesley Street E., Toronto 5.

England.—The Smithfield Show and Agricultural Machinery Exhibition will be held at Earls Court, London, from 5-9 December. Particulars may be obtained from Smithfield Show Joint Committee, Forbes House, Halkin Street, London, S.W.1.

Belgium.—The 41st International Agriculture and Agricultural Machinery Exhibition will be held in Brussels from 12-19 February. Details from Salon de l'Agriculture, Secretariat-General, 29 rue de Spa, Brussels.

Office Organisation

'Cutting the Paperwork'—the title of an article appearing in the October issue of *Automation Progress*—should be of interest to agricultural administrators, research executives and all those engaged in the business of agriculture—supplying, selling, buying, shipping, etc. It gives a description of the latest machines and methods demonstrated at the Business Efficiency Exhibition in London. These include machines for filing and computing, micro-film copying, dictating machines, addressograph machines, labelling machines—in fact everything for the office.

A specimen copy of the above journal can be obtained on application to Leonard Hill House, Eden Street, London, N.W.1.

Correction

SWINGFOG AND FONTAN

With regard to the advertisement appearing on page A35 of the September issue, the full address of the manufacturer concerned is MOTAN G.m.b.H., Uberlingen-Bodensee, Federal German Republic.

New Publications

Staple Foods in Africa

The Staple Food Economies of Western Tropical Africa, by Bruce F. Johnston. Pp. 305. Stanford University Press, Stanford, California. Oxford University Press, London. Price 48*s*.

The publications of the Food Research Institute of Stanford University on research in the production, distribution and consumption of food are well-known economic studies which deservedly command world-wide recognition. The latest volume in this series, dealing with the staple food crops over an area of nearly 5 million square miles of western tropical Africa, in which some 80 million persons live, is a valuable study of a subject rendered particularly complex by reason of the diversity of natural and social conditions in the region.

The book concerns the starchy staple foods of West Africa—maize, manioc, rice, yams, cocoyams, sweet potatoes and bananas—and considers each in relation to climatic, economic and cultural factors underlying their present geographical distribution. It is evident that there is growing conflict between consumer demands and the environmental influences which dictate the choice of crops. The author is of opinion that, while the starchy staples will continue to dominate African diets for many years to come, the economic growth of the region and rising incomes enjoyed in this part of Africa will encourage the consumption of meat, dairy products, sugar, vegetables and fruits with a corresponding reduction in the present staple foods.

Unreliable statistical information relating to this part of Africa has obviously hampered the author and perhaps accounts for his reluctance to reach precise conclusions on many aspects of his study. He produces facts, well supported by biographical references, and then leaves the reader to form his own conclusions. However, he indicates that manioc will increase in importance because it tolerates mediocre soils, resists drought and locusts, and possesses satisfactory transport and storage characteristics. Yams, because of the strong position they enjoy in the hierarchy of consumer preferences, may be favoured by rising incomes, despite the fact that they are likely to become more costly. Further, it is probable that the general tendency will be toward lower consumption of cocoyams, sweet potatoes and bananas.

Urbanisation, rising incomes and widening familiarity could well mean that rice and wheat, so generally esteemed by consumers the world over, may to some extent displace manioc in African diets. The rate of increase of consumption of wheat products has been more rapid than for any of the indigenous staple foods examined in this book.

Technical Books

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While there is little likelihood of wheat becoming widely grown in West Africa, the area under rice has increased considerably and the consensus of opinion is that vast areas of potential rice land await development. Considerable space is given to an account of the present position of rice cultivation in West Africa. Since World War II, states the author, governmental programmes for agricultural development and research have emphasised rice to a striking degree.

The growth of agricultural output will be determined largely by the energy, intelligence and resources that governments and individuals devote to the task, but, he concludes, there are strong indications that agricultural expansion in most, if not all, countries in western tropical Africa will keep pace with the growth of demand and should, in fact, make a positive contribution to the prosperity of the region.

D. H. GRIST

Fertiliser Use

Nutrition and Manuring of Tropical Crops by Prof. A. Jacob and Dr. H. von Uexküll. 2nd revised edition. Introduction by Sir E. John Russell. Pp. 491. Verlagsgesellschaft für Ackerbau m.b.H., Hanover, 1960. U.S. $7.50 net.

This is a unique and almost encyclopaedic book. The plant food problems of tropical soils and crops are frequently more complex than those of temperate regions, but the history of research into tropical requirements is relatively shorter. What is already firmly known, however, has been most diligently assembled and discussed—and with an exceptional wealth of references.

Following introductory sections on fundamental subjects, such as the major and minor nutrients, manures, fertilisers, application methods etc., each significant tropical crop is dealt with in the form of a concise monograph; altogether well over 300 pages are devoted to the manuring of 39 tropical crops or classes of such crops, *e.g.* groundnut, coffee, tea, sisal, mango, millet and sorghum. Finally, there are numerous appendices of numerical or factual kind, mostly tabulated, and a selected bibliography.

The enormous amount of work required in preparing such a comprehensive and far-reaching documentary text seems impossible to estimate, and it is sad to learn from an addition to the preface that Dr. A. Jacob died suddenly just before the printing of this English edition. Dr. Jacob's other contributions to fertiliser progress, notably his insistence upon the importance of magnesium, have already won international respect.

There are books which so superbly achieve what they set out to do that it is churlish to make minor criticisms. This is one of them. The book must be of long-term value to scientists and practical agriculturists alike, for the presentation of trial results etc. is regularly followed with practical recommendations for crop treatments.

Dr. C. L. Whittles' translation has been solidly done, though here and there German word and phrase sequence has been adhered to when a bolder readjustment would have led to a more fluent translation. This is a

book of world importance which it is a pleasure and a duty to praise so definitely.

D. P. HOPKINS

Diseases of Farm Crops

By A. Beaumont. Pp. 128. Illus. W. H. & L. Collingridge Ltd., London, 1959. Price 25*s*.

This is a semi-popular book intended for use by the farmer or the agricultural student, neither of whom is, or aims at being, an expert in the pathology of farm crops. First of all there are two short chapters of a general explanatory nature, the first dealing with the types of disease, its causation, its occurrence as influenced by the conditions under which the plant grows (effects of soil, weather etc.), and leading up to a system of nomenclature based upon symptoms shown by the various parts of the plant.

The next chapter describes the methods of combating diseases: seed disinfection, spraying or dusting the growing crop with fungicides, breeding of resistant varieties of the crop plant and the functioning of administrative measures, *e.g.* seed certification, which aim at limiting, or even preventing, the distribution and planting of material known to be infected or contaminated with disease-producing agents.

The remainder, and greater part, of the text gives a survey of diseases found in the British Isles on the main farm crops. From its special importance to British agriculture, and also from the range and seriousness of the diseases which attack it, the potato has a long chapter to itself. For ease in reference, the description for each crop is subdivided according to the stage of growth or the part of the plant affected, whether it be the seedling or the root, stem, leaves or reproductive structures of the grown plant.

The number of diseases recorded, and described in greater or less detail, is very large—the publisher's note speaks of 'hundreds'. There are nearly 100 for the four common cereals, but, as a specific disease on any one cereal is generally paralleled by a very similar one on each of the others, the substantive number is much less than 100—more in the neighbourhood of 25.

Furthermore, quite a number of diseases cited are wholly unimportant, either from their rarity or from the negligible losses which they cause. A particularly striking example of this is seen in the section on clover diseases. Twenty are cited, but, as the author himself says at the beginning, only one of them is of any practical consequence.

This raises the question: Of what interest is the occasional or non-significant disease to the average farmer or to the non-specialist agricultural student? An occasional farmer might be curious about some unusual spotting of the leaves of his crop, but it is doubtful if he could determine its cause from the brief text provided.

Viewed in this light, the very large number of diseases dealt with in this book does not add to its merits; it would have been better to exclude the unimportant diseases altogether—apart perhaps from a statement that there are many such—and to devote the space thereby saved to a fuller account of those that really mattered.

The author has had a lifelong experience of advisory work in the National Agricultural Advisory Service and the recommendations for disease control can be taken as the most up to date and the best available. The text is always clear and contains a minimum of scientific jargon.

W. BROWN

The Farmers' Guide

Today there are so many ways in which the British farmer can get assistance and advice that it is difficult for him to keep track of them all. The Ministry of Agriculture has produced a useful booklet, 'At the Farmer's Service', which gives details of the many services, grants and subsidies which are available.

Obtainable free from the Ministry of Agriculture, Fisheries and Food (Publications), Ruskin Avenue, Kew, Surrey.

American Tomato Yearbook

Edited by J. W. Carncross. Pp. 43. Box 540, Westfield, New Jersey, U.S.A., 1960. Price $2.00.

Of special significance this year is the complete chart by states of principal tomato varieties grown in the U.S.A. in 1959. There is also an up-to-date list of recent references pertaining to tomato culture, tomato diseases, pests and their control.

The book is profusely illustrated with up-to-date charts, graphs and pictures, giving a complete résumé of the tomato industry in the U.S.A. There is much statistical information, including a tabulation of states giving current data on tomato yields, acreage and production both for processing and for the fresh market.

Annual Reports

Zanzibar. Report of the Department of Agriculture, 1958. Price 2*s*.

Rubber Research Institute of Malaya. Report for 1958. From the Institute, Kuala Lumpur, Selangor, Malaya. Price $3.

E.P.P.O. Report for 1959-60 of the European and Mediterranean Plant Protection Organisation. From E.P.P.O., 142 avenue des Champs-Élysées, Paris, France. Price not stated.

Institute of Seaweed Research. Report for 1959. Obtainable from the Institute, Inveresk, Midlothian, Scotland. Price not stated.

West African Cocoa Research Institute. Report for 1958-59. Obtainable from the Crown Agents, 4 Millbank, London, S.W.1. Price 5*s*.

Imperial College of Tropical Agriculture. Report for 1958-59. Obtainable from the College, St. Augustine, Trinidad, or 40 Norfolk Street, London, W.C.2. Price not stated.

Tanganyika. Ministry of Health, Annual Report of the Government Chemist, 1959. Obtainable from the Government Printer, Dar-es-Salaam, Tanganyika. Price 2*s*.

Agricultural Research Council. Report for 1958-59. From H.M.S.O., York House, Kingsway, London, W.C.2. Price 9*s*.

British Cotton Growing Association. Report for 1958-59. Obtainable from the Association, 333-350 Royal Exchange, Manchester, 2, England. Price not stated.

East Malling Research Station. Report for 1958-59. Obtainable from the Research Station, near Maidstone, Kent, England. Price 17*s*. 6*d*. or $2.50.

National Vegetable Research Station. Report for 1959. Obtainable from the Research Station, Wellesbourne, Warwickshire, England. Price not stated.

University of Nottingham School of Agriculture. Report for 1959. Obtainable from the School of Agriculture, Sutton Bonington, Loughborough, England. Price not stated.

Demonstration near Hyderabad in West Pakistan before a group of co-operative farmers. The Fordson Power Major tractor was shown in conjunction with the FR TD 17 3-furrow disk plough on the hot, baked earth of the paddy fields

Agricultural Machinery and Implements

It is a far cry from the pointed digging stick which primitive man used for grubbing for roots to the tractor-drawn, p.t.-o driven potato combine; from the planting stick to the 10-row seed planter; from the horn-capped stick with a foot rest once used by the Maoris to the hydraulic excavator; from the hoe, mounted on a frame and drawn by struggling oxen in the Nile valley to the tractor-drawn 2-, 3- or 4-furrow reversible plough of today; from the primitive water-wheel of the Hittites to the various artificial rain units now on the market; and even from the sickle and the scythe to the latest combine harvester and silage cutter and trailer. This is the measure of the progress made over many thousands of years; it is all the more remarkable that it has all happened as a result of the development of the internal combustion engine as recently as the 1880s.

The following is a short account of a number of these recent additions to the many thousands of farming aids now on the market:

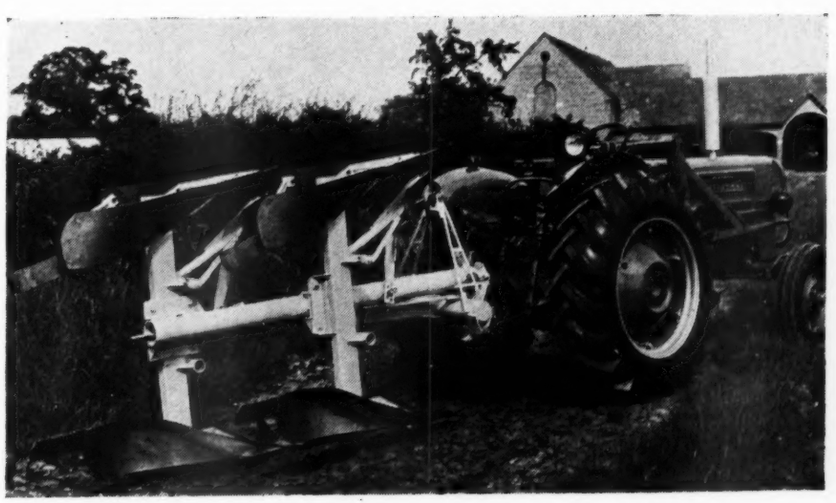
Allis-Chalmers Ltd.

At Cambridge this year, this company were showing for the first time the BTL-14D 'Tractoloader'. This is a 4-wheeled, rubber-tyred *loader*, fitted with an 87-h.p. diesel engine, for loading root crops, digging silage pits, and digging, lifting, carrying and dumping earth and other materials on the farm.

The transmission has an automatic clutch cut-out, which operates when the brakes are applied. This puts the transmission into neutral, so releasing the full engine power for loading and dumping. The cut-off can be disconnected for safety when working on downhill slopes or close to banks. Four forward speeds are provided to 23 m.p.h. and there are four reverse speeds to 29.3 m.p.h. This allows a fast loading cycle and makes for easy manoeuvrability.

Bomford Bros. Ltd.

Two years ago, this company introduced a *reversible plough*, which was suitable for all soils except the heavy, almost unploughable clays. In the meantime they have been working



Bomford's new reversible 2-furrow plough will deal with clay soils

on the design of a millboard unit, which could plough such difficult soils without clogging. An important aspect of the problem is wheel slip, which can be very serious with pneumatic-tyred tractors in such very slippery soils.

Experiments have shown that it is necessary to allow 35 in. clearance between the furrows in order to avoid choking the mouldboards through clay adhesion. This would make a 3-furrow version excessively long and produce an unbalanced combination of tractor and plough. Another reason for keeping to the 2-furrow design is that it is better to plough faster with two furrows, and so operate steadily at full engine power, than to produce three or four furrows in these soils, as this gives increasing wheel spin, wasted power and more rapid tyre destruction.

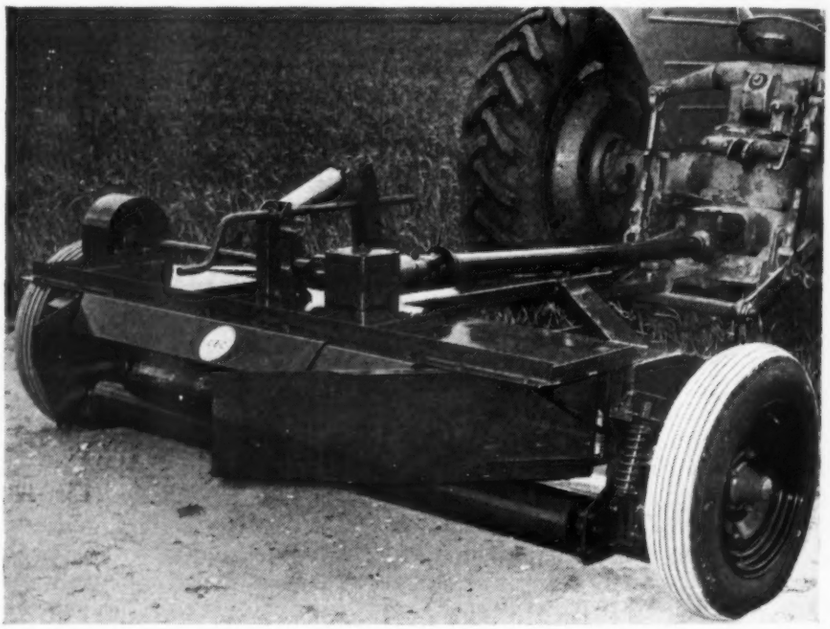
Braune (Stroud) Ltd.

Powered ploughing and cultivation is the new idea put forward by this company. Their *disk harrows* or *ploughs* are power-driven from the p.t.-o. of the tractor; this assists the forward movement of the assembly, and also ensures deeper penetration without having to angle the disks too severely.

It is claimed that the implement will not clog even under the wettest conditions, and a narrow 6-in. slice is turned, which is easier to break up than the usual chock or wedge of soil as produced by a mouldboard or static disk plough. In the implement they offer, a number of disks may be removed to suit the power available and the conditions of operation.

Catchpole Engineering Co. Ltd.

The Catchpole *hay conditioner* is a tractor-drawn and tractor-powered implement for picking up, and crushing and crimping hay. The meshed angles of the chain-driven rollers ensure a positive lift without clogging and without shattering the leaves. Where the ground is uneven, a gauge roller provides correct ground clearance and ensures a clean pick-up of the hay.



The Catchpole hay conditioner is equipped with two power-driven rolls

Braune disk harrow. Power is transferred from the p.t.-o. of the tractor through the gearbox to the disks which are rotated mechanically

Caterpillar Tractor Co. Ltd.

A new addition to the Caterpillar series is the powerful D6 *tractor*, which develops 93 flywheel h.p. at 1,600 r.p.m. Among its major features are a completely new engine, giving 25% more traction; two new hydraulic control units; and a tilt cylinder for special applications.

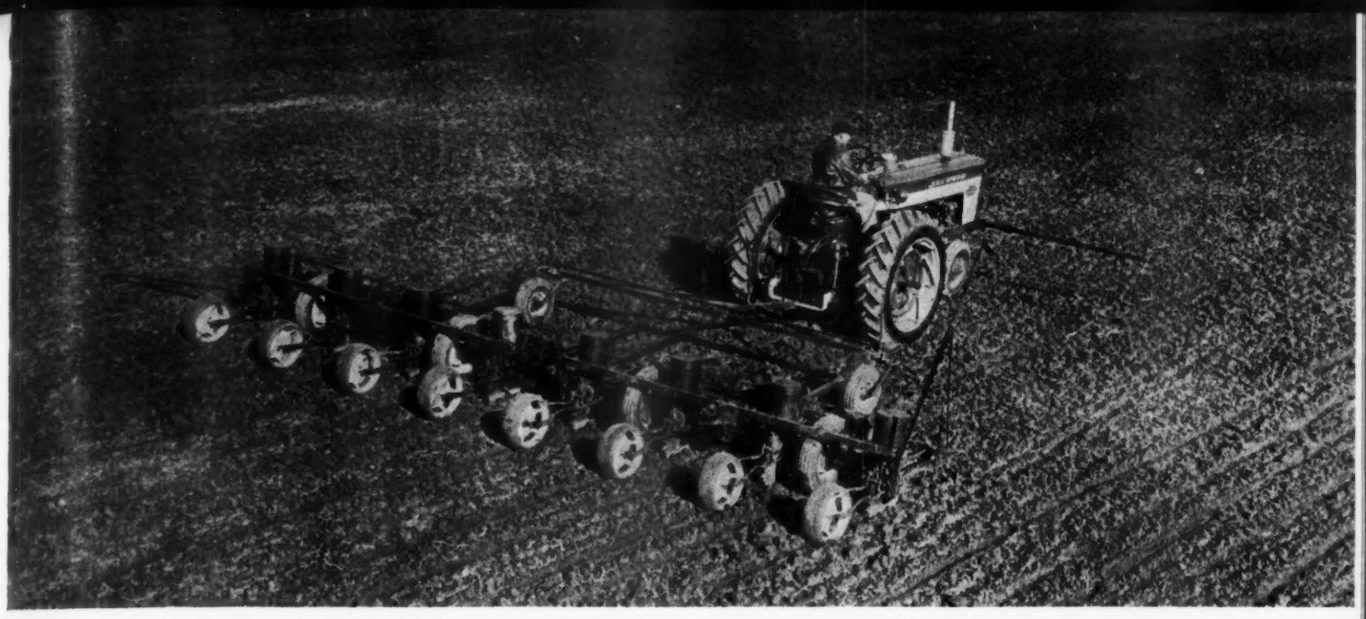
The hydraulic control pump and tank are located at the rear of the engine under the bonnet and both units have full-flow hydraulic fluid filtration. No. 165 hydraulic control is primarily for the control of a bulldozer blade and No. 143 control is for the operation of the tilt cylinder on cable controlled blades, or for the control of the tool bar and the tool bar bulldozer.

The optional forward speeds are: 1.9 m.p.h. in 1st gear; 2.8 in 2nd; 3.4 in 3rd; 4.3 in 4th; and 6.0 in the 5th gear. The reverse speeds are: 2.4 m.p.h. in 1st; 3.4 m.p.h. in 2nd; 4.1 in 3rd; and 5.2 m.p.h. in 4th gear.

Ford Motor Co. Ltd.

The 'Dexta' is proving itself a fitting work-mate for the 'Major' in together providing a choice of *tractor* power and speeds to cover all farming requirements, and it has already proved its economy for such purposes, for which it is unnecessary to use the larger and heavier tractor.

Above all, there is its versatility, for



The International Harvester duplex hitch enables two 4-row planters to be operated side by side to give 8-row planting

it can utilise most implements with category 1 linkages, e.g. rear-mounted mower; 2- and 3-furrow ploughing; cultivating with a rigid or spring tine cultivator; ridging with a 3-row ridger; combine harvesting and high-density baling with live p.t.-o.; harrowing with the offset disk harrow; deep ploughing with a sub-soiler; and fast transportation with a 3-ton trailer.

Recently a new gearbox has been fixed which offers an improved choice of gears in the lower speed range, together with increased power at the p.t.-o.

Hayters Ltd.

The latest Hayter p.t.-o.-operated, trailing, *rotary grasscutter* has been so designed that wing extensions can be added to increase the cutting width. These extensions are of two types—simple 4 ft. wing additions to increase the effective width from 6 ft. to 10 ft., with one, or to 14 ft., if two are fitted; or 2 ft. 3 in. 'Springmatic' wings, with provision for radial movement to permit cutting right up against and around tree trunks, without damaging them or the machine.

The Hayter 6/14, with its 4-ft. extensions, is said to be suitable for the heaviest grassland reclamation and for grassland maintenance and, with its 'Springmatic' wings, it is useful for cutting right up to fencing posts and round the trees in orchards.

Innes Walker (Engineering) Co. Ltd.

The 'Clydebuilt' *rotary rake* is an implement for attachment to a rear-mounted mower to comb the cut grass away from the cutter bar, and so prevent bunching and knotting of the hay. The rotating flails gather the hay into successive swathes, leaving ample space between each to allow good air circulation and so increase the speed of drying. It is claimed that this eliminates the need for one tedding operation, while the even distribution of the hay prevents baler blockages and breakages.

International Harvester Export Company

The recent introduction of the McCormick International duplex *planter hitch* has made it possible to hook two 4-row planters together to give 8-row planting and this coupled with a fore-mounted, 8-row cultivator makes it possible for farmers to prepare the seed-bed and plant accurately at speeds of up to 6 m.p.h., and so cover up to 130 acres in a day, with a row spacing of 36-40 in.

The duplex hitch can be used with any tractor, with or without hydraulic lift; the operator simply pins the tongue to the drawbar and the assembly is ready to start work. When he has to pass through gates or travel on roads, one planter is hooked behind the other.

Kvernelands Fabrikk A/S

This firm has pioneered in Norway new developments in hydraulics for tractor-drawn *implements*. They are producing buckrakes, hay loaders, disk harrows and ploughs, suited to the hydraulic system of modern tractors. A unique feature of the Silosvans buckrake are the eccentric nuts which enable the tine points to be adjusted.

Limemaster Ltd.

In the Cooper Limemaster, the

The fork-lift loader discharging the contents of a 35-cwt. pallet into the two 7-ft. distribution hoppers. Note how the engine overhangs and counter-balances the weight of the loader

The two 7-ft. distributor hoppers spreading a 14-ft. swathe of lime. Two slow-acting agitators ensure even distribution and there is little wind damage

lime spreader is built into a tractor and is an integral part of the machine. This composite unit consists of a 51-h.p. Fordson 'Power Major' engine, two 7-ft. distributing hoppers and a combined fork-lift and tipping device. The object of the fork-lift loader is to lift 35-cwt. pallets of lime or fertiliser from ground or lorry level, and deliver the contents into the two retractable sowing hoppers.

This ingenious machine is hydraulically-operated with complete control from the driving seat. While the two hoppers are being filled they are retracted and lie one behind the other; subsequently double-acting rams are used to move each hopper outwards to form a 14-ft. constant-width distributor. The machine is then ready to begin spreading seed, lime or fertiliser, as required.

Massey-Ferguson post-hole digger

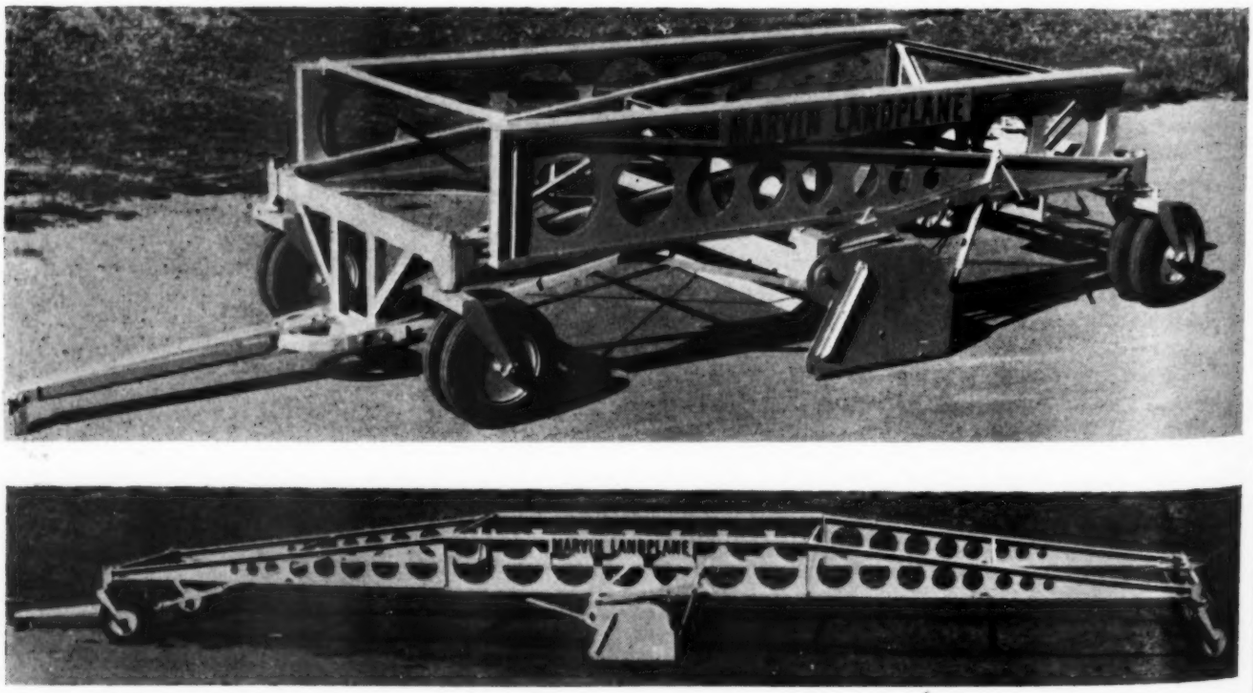
Landmaster Ltd.

The Landmaster 150 is a *cultivator* which has been specially designed for the smallholder and market gardener. The basic unit is powered by a 4-h.p., governor-controlled, 2-stroke petrol engine with 2-speed primary transmission and gear-and-chain secondary transmission. The handlebars are adjustable vertically, horizontally and for length, to suit the operator and the job.

This basic unit can either be carried directly on the cultivating rotors or on wheels, and special attachments can be fitted. Then it is ready to do many different jobs, such as digging, grass-cutting, weed slashing, ridging, pumping, cultivating with static tools as well as the rotary hoe, reverse ploughing and 2-row seeding with a special attachment. It can also be connected to a 7-cwt. trailer for light haulage operations.

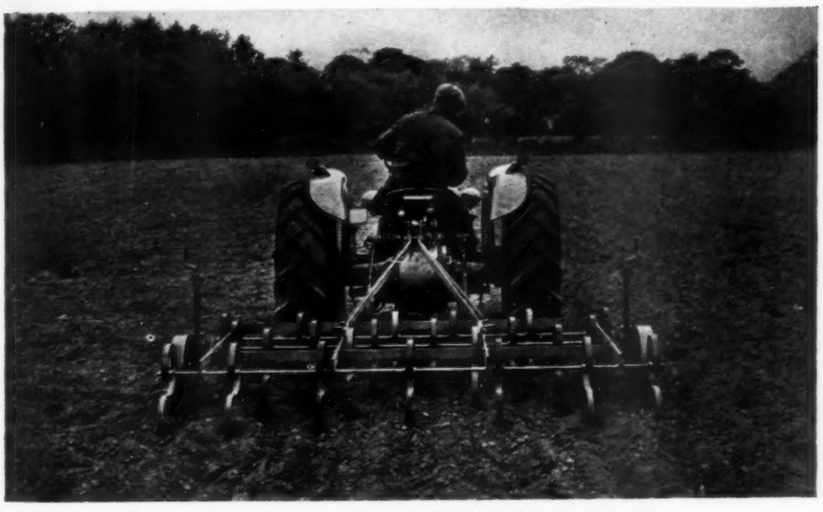
Marvin Landplane Co.

It is not at all an easy matter to level a paddy field or wheat land exactly, so as to make the best use of the smallest amount of water, *i.e.* with



This is the Marvin Landplane fully telescoped (above) *for travelling along roads. The same machine* (below) *with both front and rear sections fully extended for precision levelling*

no high spots or low spots. The *'Landplaner'* is a telescopic implement which can be extended from 20 ft. to 60 ft., according to requirements. At 20 ft., it can be transported along the roads or used for restricted operations in small fields; at 30 ft., with the bucket lifted to give a shallow cut, it is ready for rough levelling—the soil being taken from the high spots and carried to the low spots; and for exact levelling, the front and rear extensions, which carry the wheels, can be pulled out to make a 60-ft. span.



Ransome's 'Tillorator' cultivating a width of 7 ft. 6 in.

Massey-Ferguson Ltd.

Erecting fence posts can be a very arduous and lengthy business, but using a *power-driven auger* it is possible to bore a hole for a heavy fence post in well under a minute. The augers offered by this company are 3 ft. long, and 6 in., 9 in. and 12 in. in dia., according to requirements. In addition, there is an 18-in. auger capable of digging a hole 2 ft. deep, which has been specially designed for making planting holes to receive seedlings, the hole being filled with specially prepared soil.

New Idea Farm Equipment Ltd.

Their new No. 201, p.t.-o.-driven *manure spreader* can take 145 bushels of manure in one trip—which, incidentally, is the daily production of about 70 head of cattle under enclosed conditions. The outstanding feature of this particular manure spreader is the battery of 14 involute-curve paddles to shred and distribute the manure over the land.

Nuffield Exports Ltd.

The recent announcement of increased power for the Nuffield 'Three' (from 37 b.h.p. to 42 b.h.p.) is important and a further welcome modification is the linkage which operates the differential lock. This has a pedal-operated hold-in lock which produces a rigid axle drive to give extra grip in waterlogged ground. When the foot is removed from the pedal the normal differential drive is resumed. A new hydraulic lift lever which controls the linkage also makes it possible to transfer weight from the implement to the tractor whenever necessary.

The independent p.t.-o. system of these tractors allows non-stop turns to be made at the headlands with only a temporary interruption of the implement drive. The turn completed, the p.t.-o. is again engaged by means of a dog clutch.

Oliver Corporation

This company has recently introduced two heavy-duty wheeled *tractors* —the models '1800' and '1900'; the former will develop approximately 73 h.p. and the latter 92 h.p. at the p.t.-o. Both are equipped with constant-mesh helical gear transmissions, with attainable speeds ranging from 1½ to about 16 m.p.h. The '1800' model is offered for row-crop use or as a wheatland model. The first has a choice of dual, adjustable or single-wheel front ends.

Ransomes, Sims & Jefferies Ltd.

A new introduction to their extensive range of farm implements is the TCR 'Tillorator', a *cultivator* which is available in two versions—one to give a cultivating width of 9 ft. 10 in., and the other 7 ft. 6 in. The purpose of these implements is to prepare ploughed land for planting. The vibratory action of the spring tines breaks up the clods and reduces the broken ground to a fine tilth.

Root Harvesters Ltd.

The Whitsed 'RB' *harvester* is a p.t.-o.-driven potato- or carrot-lifting combine which, on level ground, can be operated by any standard tractor of over 20 h.p. The plants are lifted by a share, the haulms are removed, and the clods and stones separated from the potatoes on an angled belt. The final cleaning of the crop is done

The Oliver '1800' 73-h.p. heavy-duty tractor

Peter Standen 'Vibro-Rota' tiller converting the rough, broken ground into a smooth seed-bed

weeds to the surface where they wither away and die.

Stanhay (Ashford) Ltd.

Their 8-row, power-driven *seed-spacing drill*, designed for sugar beet, mangolds, turnips, swedes, kale, peas, maize, groundnuts, soya bean, sorghum and jute was seen in action at the annual field day at the National Institute of Agricultural Engineering, and it was also shown in motion at the Royal Show at Cambridge this year, together with a new stone-clearing attachment.

Whitlock Bros. Ltd.

The 'Dinkum Digger Major' is a mobile *power unit* to which may be attached a variety of hydraulic implements, such as the Whitlock power shovel, a power grab, a 6-ft. dozer blade, a set of ripper teeth, a crane jib, a fork-lift, a high-lift platform or a road roller. These can be mounted both fore and aft, so that it is possible by mounting two different implements to do two operations in succession without waiting to change a tool.

The outstanding features are that it can excavate to a depth of 14 ft.; the flexible arm can be swung through 190° on a 9-ft. radius; and it will lift to and discharge material at a height of 12 ft. 6 in. All this combines to make the job of excavating, lifting and loading into a lorry, a relatively simple matter with the lorry standing away from the trench or hole.

The Stanhay 8-row, power-drive, seed-spacing drill, seen in operation at the last N.I.A.E. demonstration

manually on the conveyor belt. The potatoes then pass on over a soil extractor to the discharge conveyor into the accompanying trailer. The operating capacity is given as three acres per 8-hour day.

F. A. Standen & Sons Ltd.

The 'Vibro-Rota' is a tractor-drawn and powered *cultivator* which was recently introduced by this company for soil cultivation and seed-bed preparation. It combines the action of vibrating tines with rotary cultivation, and in one or two runs can reduce the soil to a fine tilth, while working the underground roots of rhizomatous

Whittington Engineering Ltd.

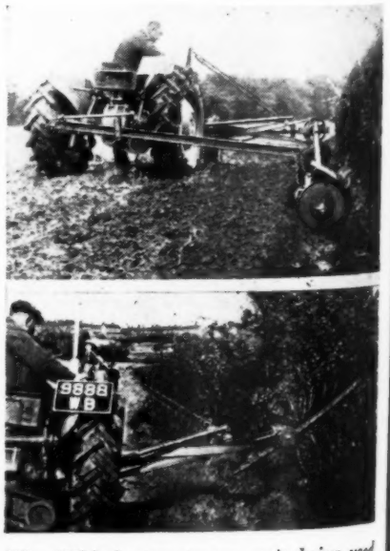
This company has produced a dual-purpose unit which can be used either as a *hedge cutter* or as a *ditch cleaner*. There is a basic frame which is attached to the tractor, which provides the necessary power through its p.t.-o., and to this can be fitted either implement.

With the cutter bar set vertically, the cutter can trim a hedge which is 5 ft. from the tractor wheel. With the cutter set horizontally, it can reach to over 8 ft. The essential part of the alternative tool—the ditch cleaner—is a circular disk fitted with cutter blades. This implement will remove about 6 in. of spoil on each run, and cut a channel over 18 in. wide.

M. B. Wild & Co. Ltd.

The Wild-Bucher 2-row *potato digger* is of very simple construction. There are no chains to wear or break, and the only moving parts in contact with the soil are the share blades and sieve frames. The machine is designed for attachment to the hydraulic lift and is driven by the p.t.-o. of the tractor. It is simple and compact, and lifts the potatoes gently with the minimum of damage, according to the makers.

Stones are normally rather damaging to chain-driven machines, but this machine, we learn, has actually been used in Australia as a stonepicker.



The Whittington power unit being used (top) *as a ditch cleaner and* (below) *as a hedge cutter*

Agricultural Chemicals and Supplies

Better Rooting

A highly active hormone in a suitable carrier is offered by *May and Baker Ltd.* for the promotion of root growth in cuttings. The very small amount of hormone required is readily absorbed through the cut end of the stem, which is thereby stimulated to form a good root system in a relatively short time. 'Seradix' B is available in three strengths to suit the type of cutting, as over-stimulation might injure the material and under-stimulation may not give the required result.

It is recommended that cuttings should be from 4-6 in. long with the lower leaves removed. Lateral shoots from the current year's growth are usually the most reliable and are best taken at a node or joint, or with a 'heel'. The ends are dipped in water, shaked and stirred in the powder. The cutting, with the adhering stimulant, can then be planted in the usual medium in a wicker or paper pot, and placed in the planthouse ready for subsequent planting out without undue root disturbance. The material could usefully be considered for the vegetative reproduction of tea, cocoa, coffee, rubber etc.

New Compound Fertiliser

A very highly concentrated compound fertiliser, called '*Shell* No. 1', has been introduced for the U.K. market. Analysis shows that it contains 17% N, 11% P_2O_5, 22% K_{20}—a total of 50% plant nutrients.

A proportion of the nitrogen is in the quick-acting form, whilst the balance as ammonium nitrogen has a long-term effect and there is an adequate balance of potash. Although comparatively low, the phosphate content has a high degree of water solubility and is said to be sufficient at the recommended rates of application for all but very phosphate-deficient soils.

The new fertiliser is a general-purpose compound which the manufacturers state can be used over a wide range of crops, and it is particularly recommended for all cereals, grassland, kale, fodder and market-garden crops, fruit and hops. Because of its high concentration, the farmer can obviously make appreciable savings in handling, storage and application costs, and the high concentration has produced a cheaper product in terms of available plant food units.

Reader Service

For further information on any item reviewed in this issue please use the card provided or write to:

Reader Service,
World Crops,
Leonard Hill House,
Eden Street, London, N.W.1
England

War on Blight

From America comes yet another fungicide for controlling potato blight. This new product is said to be completely safe to crops, men, game and stock.

'American Dithane', as it is called, is persistent on the leaves and toxic to blight spores. It is one of the dithiocarbamate group of chemicals.

Three separate spraying programmes are recommended, based on the frequency of blight attacks, with an application rate of 1½ lb. per acre.

Developed by *Rohm & Hass*, 'American Dithane' is being handled in Britain by *Pan Britannica Industries Ltd.* and *Shell Chemical Co. Ltd.*

Wonder Bar

The 'Touchweeder' offered by *S.D.C. Pesticides Ltd.* is a remarkable new approach to weed control in lawns, involving no mixing, stirring or spraying. The bar is simply drawn over the grassed area after mowing or, in the case of larger areas, such as botanical gardens or golf courses, it may be drawn along behind the lawn mower.

The principle is that two hormone weedkillers, 2,4-D and 2,4,5-T, are incorporated into a wax slab 18 in. long and weighing 3 lb. The bar is safe to use and adjacent plants bordering the lawn are not damaged, nor does it harm the grass. The bar must, however, be kept in a cool place and not be exposed to frost or hot sun. One bar can deal with ¾ acre before being worn away.

Killer for Potato Haulm

'Reglone', a new non-arsenical chemical which destroys potato haulm without danger to human beings and livestock, is the result of many years of work by Imperial Chemical Industries Ltd. and Plant Protection Ltd. at Jealott's Hill and Fernhurst Research Stations to find a haulm destroyer which is as efficient as arsenic, does not harm human beings or livestock, leaves no harmful residue in the crop and can be applied by farmers' own spraying machines. The active ingredient, diquat, is a new quaternary ammonium compound first prepared and patented by I.C.I.

After extensive tests and field trials the manufacture of 'Reglone' was begun, but for the time being sales are to be restricted to the U.K.

White Root Disease of Rubber

One of the most important scourges of young rubber is White Root disease, caused by the fungus *Fomes lignosus*. 'Tillex' liquid is recommended by *Sandoz Ltd.*, of Switzerland, as one of the most effective preparations to control this disease. It is a fungicide with a mercury compound as the active ingredient. This is used in nurseries at the time of transplantation, but preventive treatment may also be carried out by direct irrigation for soil disinfection. The budded stumps are dipped in a 5% solution of the liquid before they are planted out. After planting, the soil around the stumps is thoroughly

watered with a 1% solution of the liquid, using ½-1 gal. per plant.

For already-infected trees, there is a curative treatment which has proved successful. The roots are uncovered and the white mycelium scraped off. The surface of the roots is then treated with a 1% 'Tillex' liquid solution and, when dry, covered again with earth, which must be watered with the same solution. Severe cases require a second treatment about three months later.

Pest Control by Blanketing

One of the problems associated with the washing of fruit, vegetables and coconut meat (for desiccated coconut) is the sanitary disposal of wash waters. Many factories have to dispose of such liquid waste into a lagoon, artificial pond or sump pit, and naturally the decomposing vegetable matter makes an ideal breeding ground for flies and other domestic pests, and in certain seasons this may constitute a serious nuisance.

The usual method of dealing with this problem, if at all, has been the application of larvicidal sprays, but this does not give total control and has to be repeated at regular intervals.

Prof. C. D. McCoy, of the Purdue University Agricultural Experiment Station at Lafayette, U.S.A., has investigated a new approach to the problem. He fabricated a large blanket, 100 ft. x 144 ft. in size, of polyethylene film, extruded from resins, produced by the *Union Carbide Corporation*. This blanket was installed by four men in a half-day and proved to be easily manageable; it also withstood wind, rain and the gaseous fermentation products from the decaying vegetable waste.

The verdict of city and county officials was that it gave perfect fly control and the cost obviously will be lower than by frequent sprayings.

Weeds in Sugar-beet

Chilean nitrate of soda sprays are being used not only as a fertiliser, but also for the control of weeds in sugar-beet.

The nitrate of soda spray acts as a combined nitrogen fertiliser and also as a herbicide. This double, but contrary, action is due to the fact that the spray is beneficial to sugar-beet, but injurious to most annual weeds. It either destroys them or checks their growth.

Nitrate of soda spray is the only proven post-emergence herbicide for beet and it can save a crop which might otherwise have to be ploughed in because of very heavy weed growth. A 60% control of weeds is so obtainable, it is claimed.

Best results have been achieved on the Continent with rates ranging from 320 kg. nitrate of soda per 800 l. water per ha. to 400 kg. per 1,000 l. per ha., and in Great Britain with the similar rate of 3 cwt. nitrate of soda per 100 gal. water per acre. Alternatively, the spray can be applied to the rows alone. As the area to be covered in this case is a quarter to a half of the total, the rate of application can be reduced correspondingly.

Weed Control in Soya Beans

To obtain maximum yields under ideal conditions the soya bean crop can be planted in rows 7 in. apart with a 3-in. plant spacing in the row, but such very close planting demands effective weed control, as the soya bean plant is a very poor competitor. The use of 'Premerge'—a product of the *Dow Chemical Co.*, of U.S.A.—has not given effective control as a pre-emergence treatment, but it is now apparent from recent trials that it is practicable to use this material as a post-emergence treatment and recommendations for such use have now been drawn up by the company.

'Activated' Oil for Tractor Engines

A new type of tractor oil, designed to reduce engine wear and improve performance, is announced by the *Vigzol Oil Co. Ltd.* Hitherto, the advantage of the low viscosity of multi-grade oils have been largely offset by their lack of adhesion to metal surfaces during periods of engine idleness.

This new oil, 'Activated Vitamatic', gives exceptional surface-adhesion properties whilst retaining the advantages of the multi-grade oils. An adequate oil film is provided, even from a cold start, and the acid corrosion of the engine is now eliminated.

Garden Foil

When laid between rows of plants, aluminium foil has several advantages; apart from eliminating weeds, it keeps the moisture in the soil and for ripening fruits, such as tomatoes and strawberries, it gives quick results at a low cost. Placed under the plants, it hastens the growth of the fruit by reflecting the sun's rays to give all-round ripening.

There need also be no fear of attack by slugs and insects, since foil not only gives protection against these pests, but also against contamination of the fruits by soil splashed on to the plants by rain.

It is obtainable as ' Star ' garden foil from the *Star Aluminium Co. Ltd.* in handy 6-in. wide rolls 50 ft. long.

*What is a Chelate?**

'Sequestrene' metal chelates are offered by *Fisons Chemicals (Exports) Ltd.* in various forms for the correction of iron chlorosis and deficiencies of zinc, manganese and copper deficiency in soils.

They can either be used alone or else in combination with other chelates for the correction of multiple deficiencies of nutrient elements in the soil. Further details can be obtained through our Reader Service.

Safe and Sure

DDT in emulsion form is still a very desirable material to use to destroy a wide range of pests with a high degree of crop and personal safety. 'De De Tane 25', which is manufactured by the *Murphy Chemical Co. Ltd.*, is such a formulation, containing 25% DDT. The material is free-flowing, is easy to handle and mix, and is safe and reliable.

This product is claimed to be effective for the control of aphids on potatoes, caterpillars on cruciferous crops (cabbages), flea beetle in brassicas, the clover seed weevil, the pea aphid, the pea and bean weevil, mangold fly in sugar-beet, red beet, mangolds and spinach, and leather-jackets in cereals, flak, peas, beans, brassicas, lucerne and most vegetable crops.

*Chelate: A claw (Greek)—a descriptive name for the iron complexes of polyamino-polycarboxylic acids. The iron is bound to the molecule, but not in ionised form, *i.e.* not as a salt.

World Crop Reports

Decline in World Coffee Crop Predicted

INTERNATIONAL REPORT

Coffee

The 1960-61 world coffee crop is estimated at 71.3 million bags. A crop of this size would be about 10% below the record 1959-60 crop, which is now estimated at 77 million bags.

The 1960-61 North American crop is estimated at 9.6 million bags. This would be about the same as 1959-60, although variations are expected in individual countries.

The crop in *Costa Rica* is expected to be a record. *Cuba's* crop will probably be slightly larger than last season. The *Dominican Republic* and *Haiti* are expected to have slightly smaller crops, as this is the off-year in their alternative year production cycle, which in the past has been very pronounced in both countries.

El Salvador has had excellent flowering for the coming crop throughout almost all of its coffee-producing areas. The rains have been favourable, and a crop almost as large as the bumper 1959-60 out-turn is now in prospect.

Flowering for the coming crop in *Guatemala* has been fairly heavy, except in some of the higher altitudes. Indications are that it will be only slightly below 1959-60.

Honduras and *Nicaragua* are expecting slightly larger crops. Growers in Honduras have increased plantings in recent years and there has been considerable replacement of older non-productive trees.

Mexico's crop may be larger than last season's, which was reduced by adverse weather, and the coming season is the on-year of the two-year production pattern in Mexico. The upward trend of production in *Panama* should continue.

Total 1960-61 coffee production in South America is estimated at 46.5 million bags, over 80% of which will be exported.

Brazil's crop is estimated at 36 million bags. In 1959-60 production reached a record 43.5 million. The indicated smaller crop reflects the effect of drought earlier in the season.

Photo: FAO

Three-year-old Harar coffee growing in Ethiopia

Weather in recent months has been favourable. See page 373.

Colombia is expecting a record crop this year of 8.5 million bags. The anticipated half-million bag increase over 1959-60 will be due to an increase in producing areas, greater use of fertilisers, planting of improved varieties and improved cultivation practices. Flowering for the coming crop has been good, especially in the areas of Caldas and Tolima.

Ecuador's coffee production is expected to be higher than last season. The indicated increase may be attributed mostly to additional trees coming into production rather than larger yields per tree. Total 1960-61 production for *Peru* is estimated at 550,000 bags, which is 10% above the 1959-60 crop, and the corresponding crop in *Venezuela* is expected to be somewhat larger than production in 1959-60, which was a poor season.

Africa's total coffee crop for 1960-61 is estimated at 12.2 million bags. This would be about 8% above 1959-60 and the upward trend in production will continue.

Coffee has become the most important agricultural commodity in *Angola*, and production is expected to increase even though crop diversification is being emphasised. There is considerable land suitable for coffee and the soils reportedly need little chemical fertilisation.

Coffee production in the *Congo* may reach 1,250,000 bags. The number of trees coming into production in the Congo continues to increase and the people have recently become more interested in growing coffee. Prospects for *Ruanda-Urundi's* 1960-61 crop appear good from the harvest, which began in May.

Ethiopia's crop is estimated at a total of 900,000 bags. Slightly higher crops are expected for both *Cameroun* and *French Equatorial Africa* in the coming season. The crop is estimated at 2,950,000 bags for *French West Africa.* The rate of disposal of the 1959-60 crop was slowed during April and there is a possibility that some stock may be carried over into the next season.

Good rains have fallen over most of the coffee areas in *Kenya* and the indications are that there will be a considerable increase over 1959-60. *Tanganyika's* coffee crop is expected to show an increase over 1959-60. The Northern Province has the largest production, while the West Lake Province is second. *Uganda's* production is estimated at 1,675,000 bags.

Total production for the 1960-61 season in Asia and Oceania is estimated at 3 million bags.

Weather has been favourable in most of the coffee-growing areas of *India.* Production is expected to show an increase over the 1959-60 crop, which was reduced by heavy rains. *Indonesia* is expected to have a particularly good crop. Smallholders account for about 80% of the production. Conditions point to an increasing output of coffee in the Philippines, as more trees are coming into production.

REGIONAL REPORTS

Brazil

The 1960 *Brazil nut* harvest is forecast at 35,000 short tons, unshelled (including 1,000 tons of Bolivian production marketed through Brazil).

This season's forecast is about 11,000 tons above the estimated 1959 harvest of 24,000 tons, but still below the 43,500-ton 1958 crop. Average (1953-57) production is 38,800 tons.

The 1960 forecast by regions is as follows: State of Para, 17,500 tons; State of Amazonas, 9,500 tons; territories of Amapa, Rondonia, Acre and Rio Branco, 7,000 tons; and from Bolivia, 1,000 tons. Some sources, however, believe that the 1960 crop may reach 38,000 tons.

Weather continues to be favourable in most *cocoa*-producing sections of Bahia, Brazil, and the 1960 temporao (mid-crop) is expected to be large. This crop usually accounts for slightly over half of the total cocoa production.

Ceylon

Ceylon's interest in *cane sugar* production has now developed beyond the planning stage, as two mills are being completed this year.

The Kantalai sugar project at the settlement colony of Kantalai, near Trincomalee, will have a full mill capacity of 20,000 metric tons (22,000 short tons) of sugar per season, which it expects to reach during its third-year crushing season. The Gal Oya sugar mill expects to reach its capacity of 33,000 short tons per season by 1961. Of the 10,000 acres to be planted in this area, 1,300 had been planted by January 1959.

A third enterprise is being developed by the Ceylon Sugar Plantation Ltd. About 300 acres have been cleared for cane, with paddy rice as a rotation crop. It is believed that only jaggery was produced in this area prior to January 1959.

Egypt

Egypt's 1959-60 *cotton* crop, according to the final Government estimate, totalled 2,100,000 bales (each 500 lb. gross).

Except for the 2,281,000 bales grown in 1937-38, the current crop would be a record. It exceeds the 1958-59 crop of 2,048,000 bales by 3% and is 23% above the average production of 1,707,000 bales in the past five seasons. Higher yields this year, resulting from favourable crop conditions, more than offset an officially estimated 7.6% reduction in acreage from 1958-59. Practically all of the increase this year is in medium long-staple Giza production.

Kenya

Kenya's *pyrethrum* production during 1959-60 (July-June) is expected to reach 14 million lb., compared with 9 million in 1958-59. The Pyrethrum Board of Kenya is licensing production of about 23 million lb. in the 1960-61 season. This is the highest quantity ever licensed, even exceeding the 16 million lb. produced in 1945 under the British Government's war - time guarantee.

Pakistan

Spring and early summer drought may reduce Pakistan's *autumn rice* crop, which is about 20-25% of Pakistan's annual rice output. The harvest is in August and September.

Pakistan's 1959-60 *rapeseed* and *mustard seed* crop is placed at 369,600 short tons from 1,930,000 acres, according to the second official estimate. This is an increase of 6.8% in production and 5.4% in acreage from corresponding estimates of the previous year.

The 16% increase in West Pakistan, resulting from favourable weather and planting of new acreage, more than offsets the decrease in East Pakistan. The 20% area increase in West Pakistan is attributed to the successful grow-more-mustard campaign and to high prices the previous year.

Philippines

The 65 million lb. of flue-cured *tobacco* harvested in the Philippines in 1959 was about 5% less than the 1958 crop, but the quality is reported to be better.

Although Government statistics indicate that the 1960 harvest will be about the same as last year's, trade sources predict that it will be considerably larger. It is unlikely, however, that Philippine flue-cured production will continue to expand as it did during 1954-58.

England and Wales

Wheat generally looked well at the end of July, although lodging due to storm damage occurred in several areas. 'Take-all' was reported from many districts. The yield of wheat was expected to be 27.7 cwt. per acre, as compared with a five-year average (1955-59) of 26 cwt. and a yield of 28.8 cwt. in 1959. Generally the *barley* crop was satisfactory, despite considerable lodging in places; the yield was expected to be 25.2 cwt. per acre, as compared with a five-year average of 24.1 cwt. and a yield of 26.1 cwt. in 1959. *Oats* were variable; many crops were satisfactory, but some frit fly damage and lodging occurred in several areas and some mildew was reported. The yield of oats was forecast at 21.4 cwt. per acre, as compared with a five-year average of 20.5 cwt. and a yield of 22.6 cwt. in 1959.

Mixed corn was an average crop and was expected to yield 21.6 cwt. per acre, as compared with a five-year average of 20.6 cwt. and a yield of 22.5 cwt. in 1959. *Rye* was expected to yield 20.3 cwt. per acre, compared with a five-year average of 19.6 cwt. and a yield of 19.7 cwt. in 1959.

Beans for stockfeeding looked well on the whole, but some damage by blackfly was reported; the yield was forecast at 18.1 cwt. per acre, as compared with a five-year average of 17.4 cwt. and a yield of 17 cwt. in 1959. *Peas for stockfeeding* were a satisfactory crop and the yield per acre was expected to be 15.8 cwt., as compared with a five-year average of 13.6 cwt. and a yield of 15.9 cwt. in 1959.

Heavy rain made lifting of first early *potatoes* difficult at times, but on the whole conditions were favourable; the quality of the tubers was variable. The yield was expected to be 5.9 tons per acre, as compared with a five-year average of 5.6 tons and a yield of 5.7 tons in 1959. Second early and main-crop varieties on the whole made good growth and were bulking well; aphis attacks were severe in some districts and virus diseases were frequently reported. Reports indicated that blight was becoming widespread and progressed rapidly in the southern half of the country. The yield per acre was expected to be slightly above average.

Sugar-beet grew well and was a promising crop. The yield per acre of roots was expected to be above average. *Mangolds* were generally satisfactory and the yield per acre was expected to be slightly above average. *Turnips and swedes* made good growth; the yield per acre was expected to be about average. *Kale* was mainly healthy and vigorous.

Acknowledgment is made to *For. Crops & Mark.* for much of the information contained in the above reports.